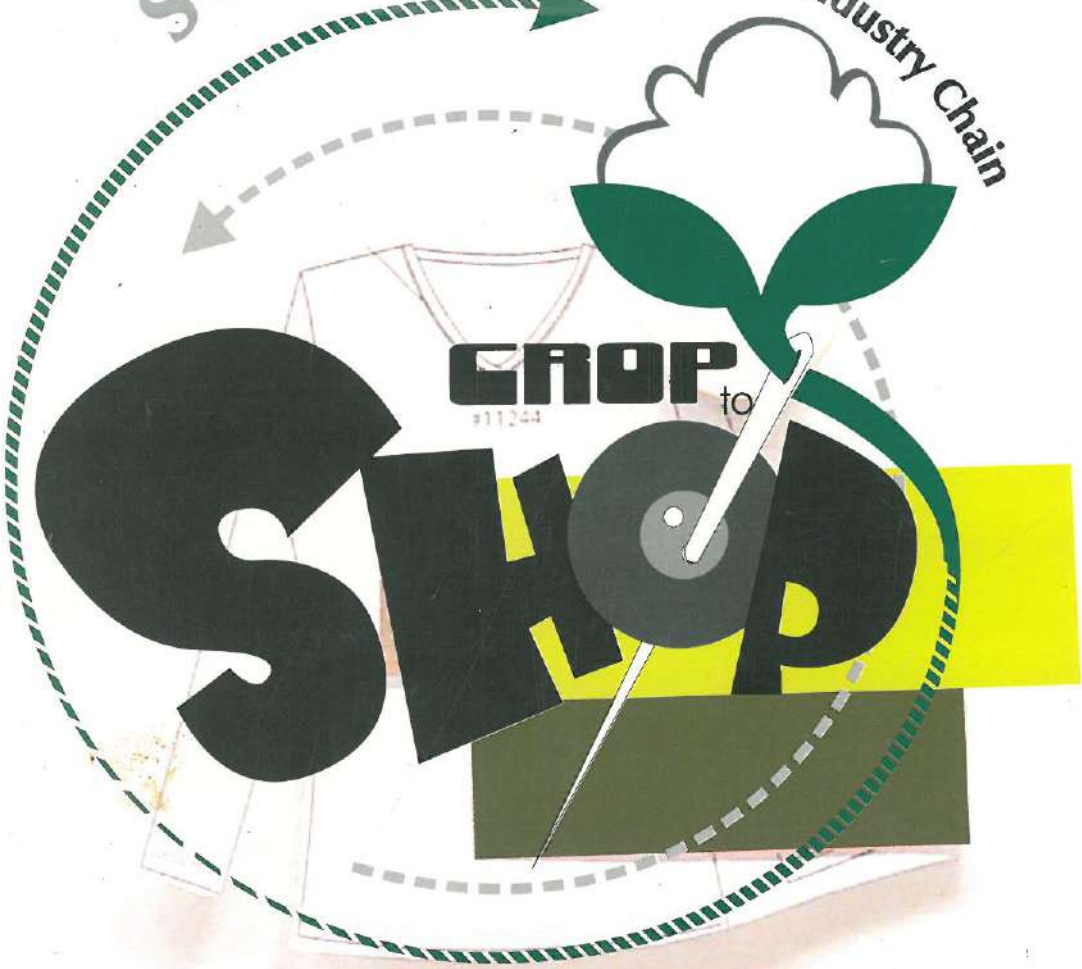
Book of Papers

International Conference on

SUSTAINABILITY

Of Textile Fashion Industry Chain



PEARL ACADEMY OF FASHION

NISTI Regd.

Book of Papers

International Conference on

Organised by

Pearl Academy of Fashion

and

North India Section of Textile Institute (Manchester) Regd.

On

28 - 29 November 2008

at

'APPAREL HOUSE', Gurgaon, India

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Sustainability of the Textile Fashion Industry Chain: Crop to Shop
Conference proceedings
Book of papers 2008

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ई.वी.के.एस. इलंगोवन
E.V.K.S. ELANGOVAN

वस्त्र राज्य मंत्री
भारत सरकार
उद्योग भवन, नई दिल्ली
MINISTER OF STATE FOR TEXTILES
GOVERNMENT OF INDIA
UDYOG BHAWAN, NEW DELHI

MESSAGE

I am glad to know that NISTI and the Pearl Academy of Fashion in association with the Apparel Export Promotion Council are organizing the conference, "Sustainability in the Textile Fashion Industry Chain: Crop to Shop". Sustainability of development is the key factor for the survival of the human race and the creations of nature. Like any other industry, Fashion industry must also be conscious of the importance of sustainability. I am very happy that the organizers of the conference have chosen a very relevant theme for the conference and have invited very good speakers with a view to sensitise the industry of this very relevant issue. I am sure the deliberations in the conference will guide the industry in chosing a developmental path which is sustainable. I wish the conference great success.

(E.V.K.S. Elangovan)

Message

Mr. Deepak Seth

I am very pleased that the Pearl Academy of Fashion, in association with the North India Section of the Textile Institute (Manchester), has organized an International Conference on the theme "Sustainability of Textile Fashion Industry Chain": Crop to Shop" at Gurgaon on 28-29 November 2008.

Sustainability has become a major focus of attention and debate in the industry. All over the world, professionals, business persons, government officials are engaged in keen discussion on how to make our planet environmentally safe for now as well as for the future. It is perfectly fitting, in keeping with these trends, for a conference on sustainability to be held in India in order to generate the necessary awakening on this subject.

The Pearl Academy of Fashion has always been in the forefront of advanced thought. Its various international conferences in the past have been highly appreciated for the freshness of ideas presented and the richness of discussions generated. I am sure that this conference will continue the outstanding contribution made by the Academy in the development of new thought in the fashion field.

I take this opportunity to extend a warm welcome to all the speakers and delegates from overseas as well as India.

I wish the conference all success and congratulate the two organizers for coming together on a single platform to present this conference.

With best wishes

Deepak Seth
Chairman,
Pearl Academy of Fashion

About NISTI

North India Section of Textiles Institute, Manchester (Regd.)

The North India Section of the Textile Institute [NISTI (Regd.)] was formed in 1989. It is a subsidiary of the Textile Institute, Manchester. The Textile Institute is an international association, spanning every sector and occupation relating to fibers and their uses, which together form the world's largest industry. Its mission is to promote professionalism and provide global network for the long-term development of the industry.

In countries where there is concentration of members, national committee and local sections have been set up to cater for their needs. Each section is run by a committee elected by it and has representatives on council who provide a program of activities that are of direct interests and relevance to local conditions. Typical program include factory visits, meetings, workshop, conferences, seminars, and social events.

Keeping in line with these objectives, NISTI (Regd.) organizes a number of activities around the year to promote professional knowledge and provide network in for growth and development. An Executive Committee comprising of eminent professionals drawn from the industry / technical institutes etc. administers NISTI (Regd.).

NISTI organizes International conferences once in two years.

In 2004, a conference was held on the theme "Innovations in the Textile Industry".

The theme for the 2006 conference was "Natural Fibres".

Both conferences were well attended and well received.

Currently, Mr Aloke Goyal, B.Tech (Text.Tech.) & CText FTI serves as the elected Chairman-cum-Treasurer.

He is assisted by Dr Vinod Shanbhag, FIIMB & CText FTI in the capacity of Hon. Secretary.

About Pearl Academy of Fashion

Pearl Academy of Fashion (PAF) was set up in 1993 by the Little People Education Society (promoted by the House of Pearl Fashions Ltd.). At present the Academy has three campuses in India (New Delhi, Jaipur and Chennai).

PAF's objective is to shape future leaders for India's fashion, design and textile industries, by constantly delivering the highest international standards. With thirteen courses at UG/PG levels, the Academy provides knowledge and training in the field of Fashion Design, Textile Design, Jewellery Design, Fashion Retail, Merchandising, Production, Communication Design and Media Make Up, Styling, Image Design.

The Academy enjoys very high employability among reputed organizations and a high status as India's most prestigious provider of education & training for the fashion and related sectors with a number of alumni in key positions in the industry all over the world. The Academy takes pride in its high caliber faculty, outstanding track record in students exchange, international networking & placement.

PAF validated programmes are being offered at Pearl Fashion Institute Bangladesh (Dhaka), Pearl Design Centre UAE (Sharjah) and Sportking Institute of Fashion Technology India (Ludhiana). Under this academic partnership, quality, curriculum, teaching and learning systems, etc. are maintained at par with international standards.

There are over 1600 students enrolled in UG & PG courses at present and nearly 1700 persons have been awarded diploma/degree in fashion and design streams since 1993. All are well placed in industry as professionals in design, merchandising, production, and retailing or as enterprise owners in India or abroad.

Fashion and Design undergraduate studies are streamed in six 4-year courses: Fashion Design, Fashion Merchandising & Production, Fashion Retail & Merchandising, Textiles Design, Communication Design and Jewellery Design. These courses are validated by the Nottingham Trent University (UK) and lead to the award of BA (Hons.) Degree.

Postgraduate fashion business studies are streamed in six 2-year courses: Fashion Merchandising, Garment Manufacturing, Fashion Retail, Fashion Design (Indian Wear), Fashion Marketing and Textile Design (Home Fashion). These courses lead to the Academy's coveted PG Diploma.

MEMBERS OF CONFERENCE COMMITTEES

1. Steering Committee

Mr. Aloke Goyal, Chairman-cum-Managing Director, Aloke Fibre-Tech (I) Pvt. Ltd., New Delhi ***(Chairperson)***
Dr. S.K. Chaudhuri, Global Head Interior Textiles, Australian Wool Innovation Limited, New Delhi.
Mr. A.K.G. Nair, Group Director, Pearl Academy of Fashion, New Delhi
Mr. Vijay Bhalla, Director, Business Enhancement Consulting, New Delhi
Dr. Vinod Shanbhag, Advisor-Academics, Pearl Academy of Fashion, New Delhi.
Mr. Dilip Gianchandani, Director, Intertek Testing Services (I) Pvt. Ltd., Gurgaon
Mr. Avinash Gupta, President, Ginni Filaments Ltd., Chhata, (U.P)
Ms. Nien Siao, Prof. & Head, Fashion Design, Dept., Pearl Academy of Fashion, New Delhi
Dr. Tarun Panwar, Professor & Head, Marketing & Retail, Pearl Academy of Fashion, New Delhi
Mr. Kuldeep Kr. Sharma, Managing Director, Megatech India Pvt. Ltd., New Delhi

2. Finance Committee

Mr. A.K.G. Nair, Group Director, Pearl Academy of Fashion, New Delhi ***(Chairperson)***
Mr. Vijay Bhalla, Director, Business Enhancement Consulting, New Delhi
Dr. Vinod Shanbhag, Advisor-Academics, Pearl Academy of Fashion, New Delhi
Dr. S.K. Chaudhuri, Global Head Interior Textiles, Australian Wool Innovation Limited, New Delhi
Mr. Dilip Gianchandani, Director, Intertek Testing Services (I) Pvt. Ltd., Gurgaon
Mr. Avinash Gupta, President, Ginni Filaments Ltd., Chhata, (U.P)
Mr. Kuldeep Kr. Sharma, Managing Director, Megatech India Pvt. Ltd., New Delhi
Mr. Rajiv Girotra, Indorama Synthetics (I) Ltd., New Delhi

3. Technical, Printing, Publishing & Souvenir Committee

Dr. Tarun Panwar, Professor & Head, Marketing & Retail, Pearl Academy of Fashion, New Delhi ***(Chairperson)***
Dr. Sanjay Gupta, Sr. Professor & Dean, NIFT, New Delhi.
Ms. Manpreet Kaur, Asst. Professor, Pearl Academy of Fashion, New Delhi
Dr. R. Chattopadhyay, Professor, IIT, New Delhi.
Ms. Ramneek Kaur Majithia, Associate Professor, Pearl Academy of Fashion, New Delhi
Dr. Preeti Goyal, Asst. Professor, Pearl Academy of Fashion, New Delhi

4. Media, Marketing & Delegate Promotion Committee

Dr. Vinod Shanbhag, Advisor-Academics, Pearl Academy of Fashion, New Delhi ***(Chairperson)***
Dr. S.K. Chaudhuri, Global Head Interior Textiles, Australian Wool Innovation Limited, New Delhi
Mr. R.K. Asthana, Consultant, New Delhi
Mr. Dilip Gianchandani, Director, Intertek Testing Services (I) Pvt. Ltd.., Gurgaon
Mr. Kuldeep Kr. Sharma, Managing Director, Megatech India Pvt. Ltd., New Delhi
Mr. H.L. Bhardwaj, Director, Shriram Management Consultants, Greater Noida,
Ms. Priya Mary Mathew, Associate Professor, Pearl Academy of Fashion, New Delhi
Ms. Meha Jayaswal, Sr. Group Manager-Corporate Communications, Pearl Academy of Fashion, New Delhi

5. Programmes Committee

Mr. Aloke Goyal, Chairman-cum-Managing Director, Aloke Fibre-Tech (I) Pvt. Ltd., New Delhi ***(Chairperson)***
Ms. Nien Siao, Prof. & Head, Fashion Design Dept., Pearl Academy of Fashion, New Delhi
Ms. Nandita Abraham, Prof. & Head, Business & Tech. Dept., Pearl Academy of Fashion, New Delhi
Ms. Preeti Dewan Mehta, Associate Professor & Head, Foundation (B&T) Dept., Pearl Academy of Fashion, New Delhi

6. Hospitality & Reception Committee

Mr. Kuldeep Kr. Sharma, Managing Director, Megatech India Pvt. Ltd., New Delhi ***(Chairperson)***
Ms. Seema Mahajan, Prof. & Head, Textiles Dept., Pearl Academy of Fashion, New Delhi
Mr. Tarun Pandey, Associate Professor, Pearl Academy of Fashion, New Delhi
Ms. Pavni Agrawal, Asst. Professor, Pearl Academy of Fashion, New Delhi.

PROGRAMME DETAILS

28 November 2008

9.00 am	**Registration**
10.00 am	**Inaugural Session** Welcome address by Dr Vinod Shanbhag, Advisor-Academics, Pearl Academy of Fashion Welcome address by Mr Aloke Goyal, Chairman, NISTI **Address by Mr Rakesh Vaid, Chairman, AEPC** **Keynote address Dr. Dorothy Maxwell, SCP Advisor, DEFRA, UK** **Inaugural address by Mr EVKS Elangovan, Minister of State for Textiles, Government of India** Vote of Thanks
11.15 am	**Refreshments**
11.45 am	**Plenary Session 1 : *"Design Interventions and Sustainability"*** **Chair:** Ms Rathi Vinay Jha, Former Director General , FDCI **Speakers** Ms. Dilys Williams, Director, Centre for Sustainable Fashion, LCF, UK Ms. Nien Siao, Head of Fashion Design, Pearl Academy of Fashion, Delhi Mr David Abraham, Abraham & Thakore, Delhi Prof Clemens Thornquist, Swedish School of Textiles, Sweden
1.15 pm	**Lunch**
2.00 pm	**Plenary Session 2 : *"Fashion Materials and Sustainability"*** **Chair**: Prof. V.K. Kothari, Dept. of Textile Technology, IIT Delhi **Speakers** Mr. Kim Gandhi, Consultant, UK Mr. Rahul Bhajekar, COO, Texanlab Laboratories LTd, Thane, Mumbai Ms. Lisa Hayes, Asst. Professor, Drexel University, USA Ms. Seema Mahajan, Head of Textile Design, Pearl Academy of Fashion, Delhi
3.30 pm	**Refreshments**
4.00 pm	**Plenary Session 3 : *"Sustainable Production Processes, Technologies & Ethical Issues"*** **Chair:** Mr. Vijay Bhalla, Director, Business Enhancement Consultingz, Delhi **Speakers** Dr. M.L. Gulrajani, Chair Professor, Dept. of Textile Technology, IIT Delhi Prof. Tao Xiao-ming, Head, Institute of Textiles & Clothing, HKPU, HK Ms. Lakshmi Menon Bhatia, Director (CSR), GAP, Delhi Mr. Yathindra Lakkana, Associate Professor, NIFT, Bangalore Mr A K Prasad, Head of TLP Division, Clariant, Mumbai

6.00 pm	**Fashion Show**
7.00 pm	**Dinner**

29 November 2008

9.30 am	**Plenary Session 4 :*"Sustainable Consumption and Retail"*** **Chair**: Dr S K Chaudhuri, Global Head-Interior Textiles, AWI, Delhi **Speakers** Prof. Tom Fisher, School of Art & Design, NTU, UK Ms. Nandita Abraham, Head of Business & Technology, Pearl Academy of Fashion, Delhi Mr Atul Ujagar, Director (India, Pakistan, Sri Lanka), NIKE, Bangalore Mr Ravi Seshadri, Regional Head of Technology, Marks & Spencers, South Asia Regional Office, Bangalore
11.00 am	**Refreshments**
11.30 noon	**Plenary Session 5: *"Policy and Environment"*** **Chair**: Mr Hari Kapoor, Director, Allied Export Industries, Delhi **Speakers** Prof. M.P. Ranjan, NID, Ahmedabad Mr. Alex Yeung, Sr Lecturer, CITA, HK Prof. Doug Miller, Chair Professor, School of Design, University of Northumbria, UK Mr Vinod Kaul, Chairman, Retail Vision Group, Gurgaon
1.00 pm	**Lunch**
2.00 pm	**Panel Discussion *"India Best Policies for Sustainability"*** **Moderator**: Mr Vimal Kirti Singh, Secretary General, AEPC, Gurgaon **Panelists** Ms. Sumita Ghose, URMUL, Gurgaon Prof. Jackie Guille, Associate Dean, School of Design, University of Northumbria, UK Dr Tarun Panwar, Head, Marketing & Retail, Pearl Academy of Fashion, Delhi
3.30 pm	**Refreshments**
4.00 pm	**Valedictory Session** Closing remarks by Dr V Shanbhag, Advisor-Academics, Pearl Academy of Fashion, Delhi Closing Remarks by Aloke Goyal, Chairman, NISTI (regd.) **Valedictory Address Prof. S.C. Anand, Chairman, Textile Institute (Manchester)** Vote of Thanks

THEME

Sustainability In The Textile Fashion Industry Chain: Crop To Shop

The textiles, clothing and fashion industries are said to be locked into a cycle of unsustainability. The relationship between productivity and resource use has entered into a chronic and unsustainable pattern.

In all five general stages in the life-cycle of textiles and clothing, there are social, economic and environmental impacts at every stage. For instance,

Materials stage: pesticides use in cotton growing, water use, genetic modification, fair conditions and prices for growers, animal welfare, use of oil in synthetics

Fabric and garment production stage: use of chemicals, water and energy use, waste, working conditions

Retail stage : working conditions, treatment of suppliers, energy use, packaging

Usage stage: detergent use, energy use in washing, drying and ironing

Disposal: landfill

Additionally, the attendant transportation leads to carbon emissions and waste, as well as congestion

Thus, the most significant environmental impacts include: energy-use, generation of green-house gases, resource depletion, water use, toxicity, hazardous waste and effluent, waste textile generation. This impact spreads across agriculture, industry, rural and urban settlements, etc.

The textile, clothing and fashion creative industries not only occupy a vast primary, secondary and tertiary value chain stretching up to the consumer, but are highly globalised in their operations. In an industry generating more that a trillion dollars revenue per annum globally, although the consumption is concentrated in the developed countries, the production is concentrated in the developing countries. Thus the environmental impacts are globally distributed.

The increasing global consumer interest in and demand for textiles, clothing and fashion has in recent times moved parallel with an intensifying concern regarding its unguarded consequences for the planet's future. Sustainability has acquired focus

in professional debate and business confabulation. This again is globally evident, what with organic and green movements among consumers, the proliferation of serious scholarship on the subject, heavy investment in research and development and the concerted international and national endeavours to take note of the groundswell and redirect policy orientation and dispensation towards achievement of environmental and ecological goodwill and sustainable balance.

Textile, clothing and fashion professionals and business persons are gradually becoming aware of the looming scenario and are gearing up, slowly but surely, to address the emerging issues. There are probably a host of concerns which engage designers, merchandisers, production and marketing managers, retailers, technologists, specialists and several others to question current directions and to seek answers for new ones which may assure planet safety and survival, while delivering equity to mankind.

As a developing country with an aspiring consumption drive and vast untapped markets, the Indian scenario appears largely divorced from this new sensitivity to practice, although a fringe intellectual trend and a weak policy posture is evident. It is none too soon to give due attention where due. The conference aims to provoke Indian and regional professional, academic and business audiences to the emerging thought and to align them with this new trend elsewhere in the world.

Walking the Sustainability Catwalk

Dr. Dorothy Maxwell
Lead Defra Sustainable Clothing Roadmap

About the author

Dorothy Maxwell has an MSc and PhD in Environmental Science and 18 years professional experience working in the environmental / sustainability arena in industry, government and consultancy in Europe, USA and Asia. For the last 10 years, she has focused on sustainable products related projects for industry, governments in several EU Member States, the European Commission and United Nations Environment Programme working on Integrated Product Policy, Producer Responsibility, Sustainable Consumption & Production (SCP), Eco-labelling, Life Cycle Assessment, Ecodesign and Green Supply Chain Management. She is currently a Technical Director of Global View Sustainability Services Ltd. providing SCP supports to government and industry. In this context she is a consultant to Defra on several SCP projects including leading the UK Sustainable Clothing Roadmap. She previously worked as an environment specialist with international consultancies Accenture and The Willis Group and Head of the Sustainable Industry programme for the Irish government. She is a representative on several EU and UNEP environmental expert groups, has produced a range of environmental publications to include the Guide for Developing Sustainable Products and Services in Industry and regularly lectures on environmental topics to industry. An alumnus of Imperial College London, she lectures on their environment MSc on Sustainable Design.

Introduction

Good morning ladies and gentlemen. It is my sincere pleasure to be addressing you at this conference ***Sustainability in the Fashion Industry Chain: Crop to Shop***. My thanks to the organisers Pearl Academy of Fashion and the Northern India Section of the Textile Institute (NISTI). My presentation ***Walking the Sustainability Catwalk*** will cover the Sustainable Clothing Roadmap initiative I am running on behalf of the UK Department of the Environment, Food & Rural Affairs (Defra) and incorporating over 250 organisations across the supply chain of clothing. This initiative has been running for 1 year to date and is an innovative approach to tackling the sustainability challenges of the clothing sector.

The topics I will cover are:-

- Introduction to the UK / EU Sustainable Consumption & Production approach and Defra's Sustainable Products and Materials Programme

- Sustainable Clothing Roadmap & Why we are focusing on clothing

- Key Sustainability Impacts of Clothing

- Action Areas the Roadmap is focusing on to include two partnership projects between the UK and India

- Contacts and Links for further information.

In the UK and wider European Union, current sustainability policies are focusing on Sustainable Consumption and Production (SCP). This is based on the recognition that many of the products and services we produce as businesses and consume as consumers have a significant impact on the environment, society and economies the Triple Bottom Line.

The clothing industry is a good example of this. It is a high value sector, globally worth over $1 trillion, employing approximately 26 million people and supporting a significant number of economies and individual incomes around the world. This economic success story also has a significant environmental and social footprint across it global lifecycle with rising consumption being a key factor in this.

Clothing is not alone in this, other examples of products and services with significant sustainability impacts include food, electronics, buildings, cars and tourism.

The sustainability impacts occur across the lifecycle stages and global supply chain of products. These include raw materials, production, distribution, consumer use through to end of life. Taking environmental impacts first, these are different for synthetic and non synthetic clothing fibres. For the UK, 60% of the fibres, fabrics and yarns produced, imported and exported are synthetics with 29% non synthetics (cotton being the majority followed by wool) and 11% unspecified. Given that many garments are composites of fibres this can complicate the impacts further. Overall, the environmental impacts include:-

- Energy use, resource depletion and generation of Greenhouse gas (GHG) emissions from processing fossil fuels into synthetic fibres.

- Significant water use, toxicity from fertiliser, pesticide and herbicide use, energy use and GHG emissions associated with fertiliser generation and irrigation systems from fibre crops, e.g. Cotton.

- Water use, toxicity, hazardous waste and effluent associated with production stage pre-treatment chemicals, dyes and finishes.

- Energy use and generation of GHG emissions from washing (water heating) and drying of clothing.

- For the UK, 1.5 - 2 million tonnes of unwanted clothing is generated per annum, with only 16% recovered and the remainder (over 1.2 million tonnes) destined for landfill.

These impacts are exacerbated by high and rising consumption levels. Key consumption issues are:-

- The "Global consumer class" continues to grow

- Variations in trends on what and where we buy our clothing.

- In the UK alone 2 million tonnes (value £38 billion) of clothing are purchased per annum, , with the fast/discount fashion sector (characterised by low cost, short lifetime garments) making up one-fifth of the UK market.

- 90% of UK clothing is also imported, so significant impacts are occurring overseas as well as in the UK. The Aral Sea being reduced to half its size due to cotton irrigation are stark reminders of the global impacts of clothing. Clothing Imports into the UK come from a range of countries including China, Turkey, Italy, India, Bangladesh and Sri Lanka.

In summary - if everyone consumes as the UK does we would need three planets to support us.

Taking the social pillar of sustainability, products and services can also have significant social impacts. In the case of clothing these include labour, ethics, trade and animal welfare. In the complex and global clothing supply chain traceability and accountability on these impacts is a key challenge for this sector.

To tackle the sustainability impact of production and consumption, the EU and UK approach is defined by the SCP and Sustainable Industrial Policy (SIP) Action Plan. The approach uses a mix of interventions targeted at lifecycle stages that will give the most effective result. Interventions can include business support/guidance, voluntary agreements with industry, consumer information, regulation, fiscal instruments, Green Public Procurement and consumer information. In addition, Defra has taken a practical approach to SCP. It is co-ordinating the development of a new type of initiative Roadmaps to improve the sustainability performance of 10 high impact products. One of these is the Sustainable Clothing Roadmap. SCP activities in Defra are run by the Sustainable Products and Materials Programme (SPM). For more information on SPM activities, see the recently produced SPM Progress Report at http://www.defra.gov.uk/environment/consumerprod/index.htm

The Sustainable Clothing Roadmap aims to improve the sustainability of clothing across its life cycle and supply chain building on existing initiatives already underway. It is based on sound evidence and is operated in partnership with

industry requiring the active involvement of stakeholders. To date over 250 stakeholder organisations along the supply chain of UK consumed clothing have participated in the roadmap to include clothing retailers, fibre/fabric/garment manufacturers, suppliers, clothing reuse and recycling organisations, charities, industry associations, government, NGOs, practitioners, academia and support organisations. While the focus has started with UK based organisations, due to the fact that 90% of UK consumed clothing is imported, it is strongly recognised that many of the most significant impacts occur overseas. Hence wider international linkages through stakeholder organisations are taking place. Through the Textile Institute, NISTI and the Sustainable Development Dialogue we have been able to develop linkages in India in particular.

The roadmap was launched in March 2007. In this time the following significant milestones have been implemented. Evidence on the sustainability impacts of clothing, existing interventions and business case have been gathered, analysed and published on the roadmap website
http://www.defra.gov.uk/environment/consumerprod/index.htm .
This has been discussed extensively with stakeholders to agree where actions would be most effective . Extensive linkages and promotion of sustainable clothing has been conducted with clothing industry partners to include the UK Textile Institute who are participants in the roadmap.

The roadmap actions are designed to add value beyond existing interventions such as those on labour conditions, fair trade and environment. Actions in the following areas were identified as being most important for stakeholders to focus on:-
- Sustainable Design
- Fibres & Fabrics & other raw materials e.g. dyes with lower impacts
- Maximising Reuse, Recycling and end of life management
!Clothes Cleaning
!Instruments for improving traceability along the supply chain (environment, ethics and trade)
!Consumer Behaviour, Awareness and Education.

The Roadmap Action Plan will shortly be published. This includes actions from over 30 key UK clothing stakeholders as well as Defra. A roadmap steering group as well as expert groups in the key action areas inform the roadmap process which is co-ordinated by Defra.

Key deliverables from the roadmap include:-

Industry projects in the following areas where greater clarity is needed:-

- Public understanding of sustainable clothing - Consumer Behaviour study (Feb Nov 08)

- The role and business case for sustainable fibres and fabrics in the future (Oct

08 March 09)

- Reducing the energy, water and chemicals intensity of clothes cleaning (Oct 08 March 09)

- Maximising the end-of-life clothing reuse and recycling in the UK (Oct 08 March 09)

- Green Public Procurement In line with the roll out of EU procurement initiatives on textiles, supporting a demonstration project on the business case for sustainable clothing procurement in the public sector.

- Developing UK and influencing international SCP Policy - co-ordinating two projects funded under the Sustainable Development Dialogue, aimed at improving sustainability in the clothing supply chain between India and the UK.

- Sustainable design partnerships (India and UK) (Oct 2008-March 2010). This will be co-ordinated by the Centre for Sustainable Fashion with the Pearl Academy of Fashion and NISTI amongst the Indian partners. A promotional film and exhibition on sustainable design will be two of the deliverables.

- Eco-efficiency in Indian dye-houses supplying the UK market (Oct 2008 - March 2010). This will be co-ordinated by Colour Connections and includes dye houses supplying Tesco and Marks and Spencer in the UK.

Dissemination events in India and the UK are proposed for these projects with the final reports also available in the public domain via the Clothing Roadmap websites.

Links for further information:-
- European Commission SCP/SIP Policy
Http://ec.europa.eu/environment/eussd/escp_en.htm
- Defra Sustainable Products and Materials
http://www.defra.gov.uk/environment/consumerprod/index.htm
- Sustainable Clothing Roadmap
Http://www.defra.gov.uk/environment/consumerprod/index.htm

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Sustainable Textiles : Present and Future

Professor Subhash Anand
M.B.E; CTEXT. F.T.I, Professor of Technical Textiles
The University of Bolton, Bolton, U.K.

About the author:

Subhash Anand is Professor of Technical Textiles at the Centre for Materials Research and Innovation (CMRI), The University of Bolton. His main areas of research activities include; novel knitted and nonwoven structures for technical applications; healthcare and medical devices; effect of laundering on sensory and mechanical properties of textile materials; composite materials; sportswear and activewear structures; filtration; geotextiles; automotive textiles; and personal protective equipment (PPE). He has published over 200 research papers in the above areas of technical textiles and holds six patents. He has organised four International Conferences and Exhibitions in medical and healthcare devices (MEDTEX) at Bolton and has organised three conferences each in Czech Republic and Finland.

Todate he has attracted over £1.5 million in grants, sponsorships and industrially sponsored research projects. He has completed assignments for ODA, UNDP and was Visiting Professor at the Indian Institute of Technology, New Delhi; India in 1984 and 2007 and Institute of Textile Technology, Charlottesville, Virginia, U.S.A. in 1994.

He is currently the Chairman of the Board and Council of The Textile Institute and was awarded Member of the Order of the British Empire (MBE) for services to the Higher Education and the Textile Industry in January 2008.

Introduction

In the age of YouTube, social networks and internet bloggers, clothing retailers have realised that there is no consumer trust without full supply chain transparency, which has led many leading brands to insist on the production of more products which have been made in a socially and environmentally responsible manner.

This is not a short-term trend but is part of a growing and long-term strategy due to new Corporate and Social Responsibility (CSR) initiatives driven by changing consumer opinions, new legislation and also by pressure from the financial community which invest in the large publicly-owned US and European retailer.

Even the world's latest financial troubles will not stop this quantum shift in textile sourcing requirements. Retailers still want to source sustainable textile products.

This month, Ecotextile News reported that Wal-Mart -- the world's largest retailer has announced a series of new goals and expectations to build a more environmentally and socially responsible global supply chain despite the tough economic climate.

The Editor of Ecotextile News, John Mowbray, said, : "Just as the global textile industry has started to question whether its journey towards sustainability can survive in these tough economic times, Wal-Mart has quite clearly said that it can." He was referring to a summit in China last month [October], where the Wal-Mart CEO Lee Scott told 1,000 of its suppliers that it would require them to the name and location of every factory they use, beginning in November for apparel. This includes all sub-contractors!

Indian textile manufacturers should take Wal-Mart's intentions very seriously. It has 60,000 suppliers globally and other large retailers such as Tesco in the UK are undertaking similar transparency initiatives. Many other retailers your customers will follow suit.

"I firmly believe that a company that cheats on overtime and on the age of its labor, that dumps its scraps and chemicals in our rivers, that does not pay its taxes or honor its contracts will ultimately cheat on the quality of its products," said Scott. "And cheating on the quality of products is the same as cheating on customers. We will not tolerate that at Wal-Mart."

- So what exactly is a 'green' or sustainable product that these brands want to source? In the Oxford English dictionary sustainable is defined as "Causing little or no damage to the environment and therefore able to continue for a long time."

- The most commonly accepted term being used by people in our industry for these types of products is 'eco-textile'. Eco stands for 'ecological' but as we all know, all textiles have an impact on the environment during their production and disposal to a greater or lesser extent.

- But the difficulty the textile and clothing industry has right now is quantifying exactly what is the environmental impact of the goods they produce. So how can retailers call textiles: 'eco', 'green' or 'sustainable'?

- These definitions will become important. Already in the huge US market, the (Federal Trade Commission) FTC is running its first workshop this month to address these issues and to make sure that the 'Green' claims on textiles can be substantiated in the USA. This means that textile manufacturers in India need to be able to provide their customers with open and honest information. Ie they need full transparency throughout the supply chain.

- Similarly, Indian manufacturers need to be very careful when selling to European customers. Europeans are much more well-informed that USA consumers and

retailers here have to be careful not to erode consumer trust and confidence in 'Eco-textiles' and do not lose confidence through misleading claims and by selling products that are not truly 'green' or 'eco'.

So what is influencing retailers and brands looking for now in terms of ecotextiles.

- **Transparency** is becoming increasingly important to retailers and also consumers.
Retailers/brands are being driven to make these changes by investors and financial analysts, pressure groups such as (PETA) and the EJF (Environmental Justice Foundation), and also consumers especially in Europe and latterly the USA.
Examples, Australian wool and mulesing (this type of product was banned by H&M) and Tesco has now banned the use of Uzbek cotton and is putting a system in place to track and trace all conventionally grown cotton. Primark in the UK recently sacked three suppliers in India for using child labour. These are primarily due to ethical considerations. But there are also ecological concerns: Look at the problems Mattel toys had with sourcing in China. Lead paint was used on products which was toxic to children. More recently we had contaminated milk. These problems have given rise to the ever more stringent Restricted Substance Lists (RSL) on goods such as textiles and clothing and it's only going to get tougher for Indian producers to export if they don't meet these requirements.

- **Climate change and CO2 on the agenda** a big geo-political issue. This will not go away in the foreseeable future and is affecting a whole range of industries who are now scrambling to reduce their carbon footprint. In the UK Continental Clothing is the first to introduce a carbon labelled t-shirt. Expect more of this. Continental has worked with the Carbon Trust to measure the carbon emissions required to produce a variety of plain t-shirts in a variety of different sizes.

- **Retailers are interested in partnerships with NGO's** and are seeing these partnerships as critical to success. They also want more direct contact with raw material suppliers ie cotton farmers. M&S works closely with Fairtrade and other initiatives such as the Organic Exchange and the RITE Group. M&S along with Ecotextile News was also a founder of the RITE Group, which stands for Reducing the Impact of Textiles on the Environment. See: www.ritegroup.org and www.ecotextile.com

- **LOHAS.** To some extent this drive towards sustainability is being led by the industry and retailers but consumers are becoming increasingly savvy, more discerning and warming to these initiatives FACT: there are now over 500,000 blogs on the internet dedicated to sustainability. The rise in sustainable consumption is evidenced through the growing markets for sustainable goods and ethical sourcing. The new LOHAS lifestyle consumer is on the rise. LOHAS stands for Lifestyle Of Health And Sustainability. Google LOHAS to find out more information about this growing movement.

- **Corporate procurement** Western governments are looking to purchase more sustainable fabrics and clothing for governmental organisations. DEFRA (Department of Environment, Food and Rural Affairs) in the UK is looking at using sustainable textiles in uniforms but big corporate clothing companies such as CINTAS in the USA are also looking at using more recycled polyesters etc in clothing for their customers as their customers look to reduce their carbon footprint.

- **CSR**: All the above reasons are driving the development of company Corporate and Social Responsibility initiatives in the sustainability area. For textiles and clothing companies this means ethically sourced products with new raw material selection where companies try and reduce their carbon emissions and source more eco-textiles.

- As an example the textiles and clothing are now starting to follow the lead of other industries such as the electronics, food (in terms of organics), automotive and architectural industries.

- We are just at the beginning of all these changes. The winners will be the textile manufacturers in India who embrace these changes and work closely with retailers and brands to ensure best practice manufacturing is in place and is transparent for all to see.

Raw Materials

- Here we will briefly take a look at some of the more promising raw materials for ecotextiles that are now starting to become more available on the market.

- **Recycled polyesters and polyamides** and now even nylon are being used in increasing quantities for certain clothes such as fleeces, trousers and even suits.

- **Tencel,** which is essentially a clean viscose made from Eucalyptus trees by Lenzing is much sought after by brands and retailers and capacity has been sold out for 2008 since early this year. Other sources of cellulose are being looked at including old cotton clothing.

- Demand for **Organic cotton and organic wool** clothing will grow but demand is likely to be niche.

- **Biodegradable.** Perhaps the most interesting are going forward for textiles and clothing in terms of raw materials. New natural fibres such as polylactic acid (PLA) such as Ingeo derived from corn-starch. PHA fibres made from bacteria and the composting of current natural fibres. But this is for the future and depends on the development of an effective composting and recycling infrastructures.

Polyester

- Recycled polyester is being used by many big names such as Marks & Spencer, Patagonia, Sears (in suits). Just about any major western brand.

- The story is one of recycling and re-use. It is much preferred if the polyester comes from post-consumer materials such as plastic soft drink bottles as opposed to second quality grade fibre or polyester polymer (pre-consumer sources).

- Several problems: lack of recycling capacity. Especially in Taiwan where many recycled polyester fibres are produced.

- Problems with colour matching depending on how the raw material is being sourced. Road-side pick up or landfill.

- No real transparency. Is becoming a real big issue. A major accreditation company is looking to develop a recycled standard with help from a major global sportswear brand.

- A new standard for recycled polyester is about to be launched in the enxt few months by the certification company Control Union.

Nylon

- Recycled nylon 6 has been used in carpets for a while but because it has been difficult to depolymerise, it has been even more difficult to spin recycled in the decitex range suitable for apparel.

- Hyosung from Korea has solved this problem and now offers a new recycled nylon 6 yarn which is being used in lingerie. It is suitable for both warp and weft knitting and is derived from discarded fishing nets among other things.

- This was a real first for the industry, which was only launched in Jan 2008. Since then Unifi has also launched a new recycled nylon version of its Repreve family of yarns which is already being used in household textiles (it is in much coarser counts that the Hyosung recycled nylons).

Cellulosics

- As the name suggests these yarns are derived from plants and some of these are considered highly desirable eco-friendly products by leading brands and retailers. Most of these so-called cellulosics are basically viscose yarns

- Probably the best known is Lenzing's Tencel fibre which is made from Eucalyptus. It is made from FSC certified forests in south Africa. The production process in Austria is extremely clean and over 99% of the solvents used in the production of

Tencel are recovered and recycled in a closed loop process. The Tencel production facility actually takes water from a nearby river and ends up putting effluent back into the reiver which is cleaner than what it took in.

- **Bamboo**: Other sources of cellulose have been used for the viscose process in recent years most notably bamboo. This has been heavily marketed as eco-friendly but retailers and brands are now looking at bamboo again due to a number of issues

1) Performance. Fabrics made from 100% bamboo are very soft but it does not perform well enough therefore it needs to be blended.

2) Transparency: where is the bamboo grown and how is it processed? Sourcing bamboo in China is not transparent enough for retailers to market bamboo as 'sustainable'

3) Fibre contamination. Because old viscose processing equipment has been used, traces of heavy metals such as lead have been found on some bamboo fabrics originating from China.

4) Result is that bamboo was a two season wonder and retailers and brands are shying away from bamboo as a viscose-based fibre even though it is easy to market as eco-friendly they are scared of brand damage.

- **Viscose yarns cannot be accredited organic** due to the solvents used in the production process. This is a disadvantage when it comes to sustainability and eco-textiles.

- **Now some work on recycling cotton clothing to derive cellulose. This is one for the future. Cotton clothes could be 'dissolved' and the fibre recovered and wet-spun**. Very early days. Very attractive to retailers.

Organic fibres

- Organic cotton. Growth is very rapid but still represents small percentage of the total cotton market around 0.2% of the total cotton crop. But market demand between 2007-08 grew by 83% according to the organic exchange.

- Demand is not as great as organic food as consumers differentiate between the associated health benefits of what they wear and what they actually consume/eat.

- As we have said the overall market for organic clothing is small but there is a big debate on price points. The large mass market retailers such as Wal-Mart and Tesco absorb the added costs of organic production and do not sell these goods at a premium. However, smaller brands and boutiques do sell organic cotton clothing at premium prices and it is good business for them.

- This last point suggests that organic may be positioned at the luxury end of the market and that is the reasoning behind the development of an organic wool industry. Luxury wool and cashmere items have already being sold as organic at premium prices.

- However, a word of warning is that water use is starting to emerge as a big global manufacturing issue. Water needs to be conserved and this is something that Nike will address at the forthcoming RITE Group conference in London. Yet organic standards do not specify limits on water use and as we all know cotton can use huge amounts for water for irrigation (if the cotton plant is not rain-fed).

- As a consequence, retailers and brands are becoming more interested in better cotton or cotton which minimises the use of water and pesticides as opposed to organic cotton.

- But supply chain transparency is still crucial. As is the ethical treatment of cotton workers.

- For wool, animal welfare is the big issue at the moment. Big brands such as H&M in Europe have banned the use of Australian merino wool that is taken from sheep flocks that are subjected to mulesing (the practise of removing the wrinkled skin from a sheeps hind quarters).

- Organic labeling can be confusing. For retailers selling organic products it is essential to maintain consumer trust in the term 'organic' as the market continues to grow. And as far as the fashion and garment industry is concerned, there are clear divisions between areas of certification. The first being national obligatory standards for organic fibre such as NOP. Certification of products is carried out by accreditors against these national Standards, and in respect of organic, the certifier must be a member of IFOAM. There are then voluntary standards such as GOTS. A New easy to understand guide to organic and eco-textile labelling has just been produced by Ecotextile News which is available to buy at www.ecotextile.com

- The continued research into the development of biodegradable and full recyclable raw materials for textiles and clothing production represents one of the best ways forward for the sustainable textile and clothing industries.

- This is especially true in certain countries where space is at a premium: UK, Europe, Taiwan and Japan. Slightly less so in the USA but here heavy-handed legislation will drive more recycling and re-use across a range of industries. Manufacturers need to prepare for this. The same in mainland China. Legislation will be a driver for change in China too.

- Biodegradable textiles are a good idea in principle but rather more difficult in practice.

- **Take a look at PLA (poly lactic acid-based) fibre** from Naturworks as Ingeo yarn. This PLA polymer is derived from the fermentation of corn-starch (dextrose sugars) and it was launched with a main emphasis on textiles when it was first developed and launched back in 2003. But due to a relative lack of performance in terms of garment after-care it has found more widespread use in packaging applications and to a certain extent non-wovens such as nappies.

- I think about 80% of corn-based PLA used is now in the packaging sector.

- Ingeo said to be close to developing a more heat stable polymer that can withstand ironing and is more suitable to dyeing at higher temperatures of deep-dye shades. This has yet to materialize as Ingeo is concentrating its capacities on the packaging market.

- The key issue is getting an appropriate infrastructure in place to support true biopolymer recovery as well as performance. There is also some contention about growing plants to produce bioplastics may affect food supply. But the the Natural Resources Defense Council, suggest that food prices and availability are affected most by higher energy prices, drought in various regions of the world, population growth, the weakening dollar, political instability, and speculation by hedge fund investors. In addition, grain prices have increased also due to greater demand in emerging economies such as China and India with the growing middle class demand for protein and better food overall. The bioplastics industry doesn't even make the list.

- Even if the most optimistic projections for growth of PLA, for example, are accepted for the next few years the amount of corn dedicated to this purpose would amount to less than 0.04 % of the world's estimated annual production of 771,717,000 tons.

- Another interesting opportunity for biodegradable textiles going forward is the use of **PHA's. Poly (hydroxyalkanoates)** known as PHAs are biodegradable and biocompatible polyester-based polymer which is synthesised from oils or sugars by certain strains of bacteria. It can be produced into a textile fibre through an extrusion process and is preferably melt-spun.

- Again this technology was The first attempts at commercialising PHA polymers resulted in a partnership between Procter & Gamble Chemicals and Japan's Kaneka Corp in 2003, which hoped to develop a joint venture plant to make P&G's new Nodax family of biodegradable PHA polymers, which are quickly produced from fully renewable resources.

- PHA has mechanical properties comparable to high-grade polyethylene and polypropylene in terms of strength, flexibility, and toughness with good drapeability and since it is a member of the polyester family it has also got

similar dyeability, printability, and compatibility properties.

- Demand for biodegradable polyesters is said to be growing by about 30%/yr, though from a relatively small base.

- One of the most eco-friendly fibres which is currently available but often overlooked is wool. Wool is naturally renewable, biodegradable and doesn't use the huge amounts of water or pesticides that cotton does. It's not made from petroleum either. These are some of the qualities that retailers and brands are looking for their new eco-textile programmes. Wool also has a 'wholesome image' which is often associated with animals but is difficult to describe or quantify very different than from a cotton plant.

- One of the biggest barriers to the wholesale implementation of the current crop of biodegradable and annually renewable textile fibres is a lack of infrastructure. Germany is the nearest to developing an effective composting system for clothing although there is are effective recycling infrastructures in place throughout Europe. In the UK it is estimated that more than 1 million tonnes of textiles are thrown away every year, with most of this coming from household sources. Textiles make up about 3% by weight of a household bin. At least 50% of the textiles thrown away are recyclable, however, the proportion of textile wastes reused or recycled annually in the UK is only around 25%. The government is setting targets to improve this.

What can Indian textile manufacturers do?

- Textile and clothing producers and designers cannot afford to ignore the new macro-trend towards sustainability which is now here to stay. This is not a short-term fashion trend but a long term strategy for the planet and for business as a whole. It is what your customers in the west want because it is what their customers want. In addition shareholder pressure and legislation will accelerate this trend.

- Advice is to make sure that your manufacturing facilities and where you source raw materials are fully transparent. This is critically important for your customers in EU and the USA. They cannot afford brand damage and the associated costs of sourcing eco-textile products that are not what they claim. Recent brands that have suffered due to lack of transparency in the supply chain include: Lululemon (Canadian yoga wear chain and Primark in the UK).

- Suppliers who operate 'shadow' factories to fool auditors are the next casualties. Brands and retailers in EU and the USA are now putting teams into place to stop this practice as the national newspapers in these countries are looking more closely at these issues.

- Retailers and brands want to see that textile producers are educating their work-force about environmental and ethical issues. It makes a good story for them and makes them feel good. Also, it is just good anyway. Why shouldn't textile

manufacturers do their bit for the environment too?

- Source out suitable NGO's to work with such as RITE or the Organic Exchange and find out how you can work with these organisations.

- These organisations may provide advice on best practise such as using reputable suppliers of dyes/chemicals and how to minimise fabric waste during production. Also, it's important to get the dyeing operation running close to maximum efficiencies by making sure there is colour consistency and 'right first time dyeing'. Using only as much water, power and chemicals as is necessary can lead to significant cost savings and have a positive impact on the surrounding environment.

- Stay informed about new developments in terms of new eco-textiles, raw materials, dyes/chemicals and read more about what retailers are thinking. Read Ecotextile News!

- Also remember that improving your manufacturing processes can also improve your profit margins. So being kind on the environment can also mean being kind to your bank balance and ultimately to the success of your business.

- Becoming more sustainable goes hand in hand with growing your business and attracting new clients.

- Money may not grow on trees, but being kinder to trees and the environment will in future certainly help the best Indian textile manufacturers who takes these issues also make more money.

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Plenary Session I

Design Interventions and Sustainability

PROFILES OF THE SPEAKERS

Plenary Session 1 : *"Design Interventions and Sustainability"*

DILYS WILLIAMS
Director of Sustainable Fashion and head of Centre for Sustainable Fashion within London College of Fashion, part of the University of the Arts London.

Dilys has been instrumental in the development of a new Masters degree in Fashion and the Environment and has pioneered the setting up of the Centre for Sustainable Fashion, which will act as a one-stop shop for sustainability within the fashion sector across the entire supply chain.

Dilys' professional background reflects her ethical fashion credentials having worked with Katharine Hamnett for the past ten years on collections for both the European, US and Japanese markets using organically produced materials and promoting awareness of issues surrounding both ethical and environmental design and production methods. Her commitment and interest developed further when taking up a teaching post at LCF as Course Director for Product Design and Development for the Fashion Industries. Encouraged by the enthusiasm and concern shown by students and staff, she has been able to embed environmental and ethical design, sourcing and production teaching and learning into the curriculum.

Dilys is currently on the steering panel of "Fashioning an Ethical Industry" a Labour Behind the Label project, which aims to equip students to play an active role in raising standards in the supply chains of the companies they will be working for by providing them and their tutors with a global overview of the garment industry and an awareness of initiatives for improvement. Dilys is also on the judging panel for the Observer Ethical Fashion Awards.

Dilys is currently the media spokesperson for LCF and has contributed to Radio 4's You and Yours, BBC 2 Newsnight, BBC Wales news and numerous magazine and newspaper articles.

Recent projects include the 'Shared Talent' project in South Africa where students from six different courses at LCF were taken to work with craftspeople and South African students to collaborate to develop and produce a collection 'People Behind the Project'.
LCF@OXFAM, where students and graduates have combined aesthetic and sustainability criteria to all aspects of their work.

NIEN SIAO
Head of Fashion Design, Pearl Academy of Fashion, Delhi

Presently the HOD Fashion Design at Pearl Academy of Fashion, New Delhi Nien Siao has been associated with Design Academics for last 12 years.

A graduate in Industrial Design Textiles, from National Institute of Design, Ahmedabad, she has been working in the domestic and export textile sectors specializing in fashion fabrics and home fashions. She has worked extensively in the areas of retail fashion, home made-ups, carpets, woven textiles, soft toys, and craft textiles in India, Nepal and Ethiopia. As a professional trainer she has worked with corporate businesses, craftsmen and entrepreneurs in areas of design, skill, product and strategy development.

Considering her contribution through education as means to build the design future for the country, Nien evinces keen interest in the development of Indian fashion retail and adoption of sustainable practices in fashion development. She is an active member of Textile Institute forum, UK and continues to be involved in both fashion and textiles related research, craft development and sustainable design practice.

DAVID ABRAHAM
Abraham & Thakore, Delhi

David Abraham, a graduate of the National Institute of Design, Ahmedabad; is the Creative Director of Abraham & Thakore, a fashion and home textiles brand that is sold in India and overseas. This was one of the first brands to exhibit at "Scenes D' Interieur and Maison d'objet" a show in home fashion twice a year in Paris. They exhibit their collections at Scenes D' Interieur, Maison D'objet and Tranoi, Paris twice a year. Mr. David Abraham has been supportive of development in design academics and has appeared for juries at competitions, final graduation shows and seminars across the country.

DR. CLEMENS THORNQUIST
Swedish School of Textiles, Sweden

Dr. Clemens Thornquist's holds the chair in Fashion Design at the Swedish School of Textiles, Bor Sweden. His research focuses on the intersection of fashion, art, philosophy and organisation. Dr. Thornquist's professional experience comes, in part, from being arts manager for theatre director and visual artist Robert Wilson and freelance designer for Vivienne Westwood.

'What is the role of design in moving us towards a more sustainable fashion industry where social justice, ecological balance, culture and identity are part of the definition of fashion? What are the practical implications of such a role?'

Ms. Dilys Williams
Director, Centre for Sustainable Fashion, LCF, UK

1. INTRODUCTION

Fashion design as a discipline is a way of satisfying the designer's yearning to create, to bring energy and excitement to a situation, it heralds a desire to provoke and reflect contemporary society needs. In order to achieve these aspirations, design needs to radically revolutionise its methodology. We are in a time of danger and opportunity in fashion design, but we can only seize this opportunity if we can unlock ourselves from the current hierarchical system to embark on a collaborative interdisciplinary approach in its broadest sense.

Design is everywhere. It is in all of the processes and the journeys taken in developing fashion, from the initial decision that kick starts the life of an as yet unseen piece, to the final rejection or exhaustion where it is deemed to be over. Eighty per cent of the social, environmental and cultural impact of a fashion product is determined at design stage. Fashion design has, in the main, become de-coupled from its fellow protagonists and in so doing has lost sight of the joy of making through engaging with those involved in the process the creation of something through the coming together of complimentary or sometimes opposing techniques, dreams, ideas and processes.

The original meaning of the word fashion is 'something that is made'. By the end of the Black Death in 15th century Europe this had evolved into meaning 'something that is made together'. It was then further developed into meaning 'something that is made together with commitment to style and togetherness.' This resonates with Pluto's definition of the highest form of arts in 300BC to be determined directly by how the makers and the spectators participate in the programme.

When I embarked upon my career, it was into an industry where the designer, the pattern cutter, the sample machinist, the factory manager, the textile mill and even the sales team were all involved in the creation of an expression of our times. We had a great time we worked hard, at times in harmony, at times in discord, but essentially we navigated a path in which we engaged our collective expertise to produce a collection only achievable with all who were involved. What we now know of course is that we

neglected to include the crucial collaborator the source of all of our resources, and the receiver of many of our cast offs mother earth. We were naively oblivious to the increasing impact that we were having on the earth's capacity. It did, however, involve the designer as a catalyst in a shared process and dialogue with many of the people involved in the creation of the collection. This was a time when sample rooms existed to experiment with materials, construction and shape until a confirmed toile could be produced and patterns perfected relating to specific materials, technique and machinery available. It was a period when designers spent time with makers to be inspired by the skills and equipment at their fingertips. Then along came 'fast fashion', and not just at the bottom end of the market. Fast soon reflected status as well as accessibility. We couldn't wait even for our jeans to age - we cheated, we sped up, cut out - ultimately disassociating ourselves with the processes. We decided upon the outcome before we embarked upon the development. Fashion was redefined.

The UK's reputation in fashion went from radical provocation to mass-market giant retailing phenomenon. Through clever application of technology, demand from society, and a perception of excitement, the UK High Street has become the jewel in its fashion industry's crown. However, this interpretation of fashion has consequences down the line, none more so than in relation to consumption levels.

In 1997, the average UK woman bought 19 items of clothing a year. This has now risen to 34 items per year. This translates into 35kg per person per year 2.15 million tons in total per year in the UK alone. In monetary terms, £38.4 billion is spent annually on clothes, with £1 in every £4 spent on bargain fashion showing the huge shift in consumer purchasing habits over the past ten years.

The impact of this craze for consumption is catastrophic on a number of levels. In 2006 the clothing and textiles industry produced up to 2m tons of waste, 3.1m tons of CO2 and 70m tons of wastewater, with an estimated 1 million tons of textiles going to landfill globally.

This high volume model has a direct impact on the people involved along every point of the supply chain. The global clothing industry employs over 26 million people supporting a significant number of economies and individual incomes around the world. Just taking the example of cotton production, two-thirds of the world's cotton is produced in developing countries. And in conventional cotton farming, an estimated 1 million to 5 million cases of pesticide poisoning occur every year, resulting in 20,000 reported deaths among agricultural workers and at least 1 million requiring hospitalisation. There are many other social issues to be considered within the clothing industry and this highlights just one of the pressures communities around the world are directly put under by a high demand for fashion products.

The issues that are facing design in the fashion industry can thus be categorised in three areas: social justice, ecological balance, culture and identity. The ultimate status quo for each of these scenarios could be described as follows:

1. **Social justice**: the real democratisation of fashion where all those involved in the creation and life of a fashion piece have a voice, an acceptable and a safe standard of living, a chance to demonstrate their skills and thus, through design, nurture better lives both for producer and consumer.
2. **Ecological balance**: where resources used are renewable, energy use is effective and appropriate, water use and CO2 emissions are radically reduced and reconfigured and where waste becomes an outmoded word through new practices and new approaches to the methodologies in fashion.
3. **Culture and identity**: the homogenisation of fashion is a characteristic of the loss of value and values in society in the west where we can wear something without reference to its 'life journey' where the identity lies in the price tag and its relationship to celebrity endorsement of the brand name. Fashion has the power to redefine itself again to celebrate culture and identity through its form and function.

Fashion matters. It plays a unique and important role in our lives. As humans, we need to be delighted, we seek the new, our love affairs grind to a halt when we are no longer intrigued, surprised or delighted the same happens with our clothes. In the words of celebrated architect Michael McDonough, 'we have a tormented need to see things in novel ways....this is very connected to who we are as a species and we shouldn't shrink from the job of having fun and discovering new things.' This has synergy with Kate Fletcher's approach, identifying a new destiny for fashion and textiles, playing 'another role that helps us both identify the causes of sustainability problems and cultivate new aspirations.'

We need to rethink how we, as designers, can do this sustainably. We have a desire to please, to excite, but currently A YouGov report shows that 46 per cent of people's clothes - an estimated 2.4billion items - have sat gathering dust on shelves and hangers and were not worn once in the last year. What are we achieving as designers?

This discussion aims to outline a theoretical framework, which supports and offers a model for design that promotes sustainability, achieving harmony within its three interlocking areas social justice, ecological balance, and culture and identity. This will be tested through case studies looking at real world applications. Analysis of these will lead to the development of tactics for industry change - a context for the Centre for Sustainable Fashion to promote a system for design that is ever evolving, adaptable, responsive and has positive effect, contributing to cultural change, a shift in societal values and influencing a new aesthetic in fashion.

2. THE ROLE OF DESIGN IN SUSTAINABILITY

Collaborative design

How can we integrate the principles of sustainable design into a framework around which designers can share a methodology thus creating a collective approach whilst retaining the individuality of the designer? This requires a collective building of knowledge, skills and values in order to empower designers to individually engage with a collectively agreed set of criteria and opportunities. This is a very new approach for fashion design - a discipline traditionally characterised by its elusive nature, its secrecy and its fierce protection of ideas and rights to ownership. We need to change direction from the traditional model of competition, to encourage sharing of best practice, thus opening up the potential for innovation and surprise. This new theoretical framework re-positions designers as communicators across the supply chain, empowering them to contribute to real change in the way that fashion is perceived, created and consumed. But how can we create a new system when we are locked into a system where the designer does not experience many of the factors involved in the process how can we re-connect the disconnect?

A sustainable system for collaborative fashion design can draw on models outlined by design theorists and practitioners such as Chapman's *Emotionally Durable Design*, Braungart's *Cradle to Cradle* and Datchefski's *Total Beauty of Sustainable Products*. These and other emerging ideas contribute to dynamic approaches to design. Alistair Fuad-Luke looks at 'revitalizing the idea of design' through models such as co-design, user-centred design, where the best-designed products and services result from understanding the needs of the people who will use them and experience design, based on a consideration of an individual's or group's needs or desires, beliefs, knowledge, skills, experiences and perceptions.

Case study Shared Talent

The real democracy in fashion is where the cutter, the maker and the designer are valued and the values imbued through the piece reflect this engagement. The Centre for Sustainable Fashion has developed a project model where the protagonists of fashion production work collaboratively across the design process. Students and graduates working in product development, design, construction, buying, merchandising, supply chain management and promotion have all worked together to develop product ranges in a shared environment, in contrast to the professionalised segregated set up found in most businesses. To augment the experience, these teams worked in South Africa with local students and crafters with the aim of bringing diverse skills and insight to the collaborative design process to produce a truly unique collection. The model can be credited with developing designers as systems thinkers who can simultaneously view the 'workings' across the supply chain when they make decisions about design. This model requires a deep understanding and respect of the complementary roles, borne of mutual learning and shared experience.

User-communicated design

The environmental movement has grown in size and stature, it communicates awareness but this is not leading to significant consumer action. How can design remain in touch with the user and, through working collaboratively, have an

understanding of the consumer's wants and desires? What are consumers' expectations of a sustainable fashion product?

Attempts to create fashion business models with deeper meaning first became apparent in the 1980s when a variety of fashion enterprises were established with the primary aim of poverty alleviation. These were typically intertwined with charitable organisations and NGOs with little regard for style and design. In fact by the 1990s, a new eco-chic trend emerged, with a desire for garments characterised by natural looking colours and fibres offering a message of the wearer being 'environmentally friendly'. The aesthetic of looking 'eco-aware' had at this stage a higher priority than the actual credentials of the pieces.

The rise of fast fashion in the last decade could be translated as a moment of empowerment and democratisation for the mass UK buying public. For the first time, catwalk trends made their way to the high street in the blink of an eye and the high volume low price model has enabled all of society to adopt a fashion persona. But the sobering truth is that whilst we believe we are getting a good deal due to the rock bottom prices, the statistics tell us that in fact spending is up. 'The average cost of clothes has dropped by 36% over the last ten years but spending is up by a third.' We are remaining true to the philosophy that fashion is at the heart of our culture and important to identity formation, but translating this in a truly destructive manner.

The past couple of years have seen the profile raised on issues of ethics and the environment in our clothing production. Intelligence from TNS Worldpanel confirms that consumers' ethical concerns over fashion did hit a record high in 2008:

- Three quarters of Brits say ethical considerations are important when making a purchase, more than ever before.
- Over half of consumers are sceptical about ethical claims.
- Community benefits are cited as more important than environmental concerns.

We are entering an age where consumers have high demands of their fashion on many levels in terms of style, value, price, and now ethics. The British high street has seduced the buying public into wanting more, and associating identity with affordable accessible fashion, and now it is being demanded to offer ethics and transparency in addition. In terms of what this means for a sustainable design aesthetic, consumers are looking for hidden value in their clothes. Pieces should not be tagged or be instantly recognisable as having sustainable credentials, but that information should be available to the consumer through brand identity and trust, and the fashionability of products should in no way be jeopardised.

Equipped with a new approach to design, this presents a great opportunity for the designer to excite and engage the wearer through their work. Models with new possibilities can emerge, such as design for adaptation, design for disassembly and mass sustainable design where scale can be achieved. But lest we forget, there needs to be transparency across the industry in order for real change to take place

design can take the rap for past indiscretions, but the responsibilities for the future cannot be laid solely at its door.

Case study - Reap What You Sew

Filmmaker Nicole Mackinlay-Hahn's Reap What You Sew provides video reflections about food, shelter, and clothing, making the invisible visible. At a time when ethics have become fashionable, this installation takes a lyrical and poetic journey from African seeds to American stores. 'Mirror/Africa' is a series of films that weaves anecdotes to explore the heart behind the politics of purchasing. The intent of the project is to bring awareness to conscious consumerism, to improve appreciation of material goods, and to celebrate cultures along the African supply chain. While this initial project focuses on Africa, MacKinlay-Hahn plans to extend this into a series by growing Reap What You Sew with focuses on other developing countries such as India, and China, as well as industrialized nations such as the US, Japan, and South Korea. Reap What You Sew debuted in Barney's department store earlier this year and allows consumers to have an understanding of the hidden value of fashion.

Design as an influencer of consumer behaviour

We have looked at how the role of the designer can apply collaboration and communication across the supply chain to improve the sustainability of a fashion product. To have longer lasting impact, the designer can find ways to interact with the consumer and change the way that person acts and feels in relation to fashion.

The use of strategic innovations in technology has the potential to make significant impact on all aspects of the fashion system, however not in isolation. Through collaboration, design can act as the conduit for employing technology and affect change in consumer behaviour, as we have seen in other industries. For example in electronics where intelligent product systems, behavioural steering and eco feedback are communicated through the design of household appliances embodied in an insulated kettle retaining heat, showing a light to advise that there is no need to reboil.

Applying technology to design creates new opportunities to affect behaviour change in consumers. Rather than telling consumers to act in a different way, designers can pre-empt any resistance by making decisions for them in the design of a product. This may affect the way fashion is bought, worn, washed, transformed, passed on or disposed of, thus decreasing negative social, environmental or cultural impact, and may even create positive impact.

In some cases, not only can our behaviour be changed by clever design but also the way in which we feel about our clothes. Design can build consumer attachment into our fashion, subtly evolving the accepted norms and parameters for users. This can be taken a step further and openly involve the user through a process of co-creation. Technological advances have made it possible for the user to be a part of the design process. In an extremely bespoke scenario, Prior2Lever have worked with orthopaedic surgeons and fashion footwear designers to design highly individual

bespoke sports shoes for professional athletes using foot scanning and rapid prototyping technology. On a mass level, projects such as the Nike i-d and AdiColor trainers have delivered customisation to the masses. By influencing the look and feel of the product the user automatically has heightened attachment and a pride thus impacting on the way in which the product is regarded, used and disposed of. Potentially this process could be used in a model, which along with creative input also imparts the user with a sense of the journey a product has taken to reach his or her hands. Mass customisation has been around for twenty years, but the mass consumption model still pervades as it is 'easier' to manage we need to design a new system so that the current one is no longer the 'easier' option.

Technology sometimes seems to be at the helm, but consumption patterns and choices can also influence technology. If we demand transparency, there will be a push to create the technology to satisfy this demand. Track and trace technology is enabling product supply chains to be available both on business-to-business and consumer levels. Pioneers such as Historic Futures and Sedex are promoting a way of working which is transparent from concept to carrier bag. Major UK retailers such as Tesco are currently looking at ways to use this technology online to make it available to their customers, building on models developed through Dutch organisation Made By. Through these technology innovations consumers can once again connect with a supply chain that has been globalised and homogenised beyond recognition, developing a sense of understanding and history.

Case study DePLOY

London-based DePLOY have a business model which allows the consumer complete interaction with both the label and the product. Their womenswear collection uses a modular system to offer a demi-couture service. Each piece has been designed with detachable elements, so a dress can be taken apart to form a skirt, a top and a belt. Each element can be worn independently or together, and can be coupled with other complementary sections. The process of purchasing can be a holistic experience where the user meets with the designer to discuss her needs and requirements and a capsule collection is developed over a period of time. The backbone of the collection consists of timeless pieces that can be refreshed with additional elements as trends come and go. DePLOY are establishing a new sense of co-creation with the user that allows her to define her own style and have a wardrobe that is the antithesis to the fast fashion system. It encourages craftsmanship and celebrates quality on a level that is manageable, profitable and scalable.

Design as a new aesthetic

In order to find a new system for design the preceding models must be considered and then transcended. To establish design, as a new aesthetic then we must correlate utility with desirability, transform efficiency to effectiveness, and be designing in a way that not only takes us to zero impact but also delivers beyond to a state of positive impact.

The world is full of discarded fashion whose only crime is to not be wearable in aesthetic terms. The life has been sapped from the pieces. If in fact they had been designed using a new system then the user may have a sense of their anonymous journey through a thousand pairs of hands and would be compelled to use and dispose of them differently, either through choice or subconsciously. By using a new system we can aim to design a longer lasting love affair for the consumer into the product.

The new aesthetic imbues personality into the product. The designer and the consumer can attach human attributes to fashion. The friendly sweater communicates connection throughout its many guises from concept through to end of life, and if we adopt a cradle to cradle approach then the there is no end of life, only ascension to another.

Architect Michael McDonough promotes durable design as one of the ways forward, where objects are designed with longevity in mind. This is one facet of the new system but not the only way forward. We need to make the 'right' things more long lasting. On first inspection, fashion would seem to be the antithesis of durable and therefore unsustainable but by incorporating the sense of longevity with adaptability and responsiveness then a future-proofed product can be achieved. In fact the ultimate fashion system is one that not only eliminates negative social, environmental and cultural impact but also imparts positive impact in these three key areas, and achieves the status quo. One of the joys of fashion is its ability to change, respond, mutate and adapt. Used in the right context, this transformational power can create the new aesthetic for design that constantly strives for harmony and responds to our planet's evolving needs.

The recent Fashioning the Future Summit at the Centre for Sustainable Fashion brought together designers who have all adopted this system in many different ways. Designers such as Manon Flener, Lindsay Weir, rani jones, Rachel Cassar, Nimish Shah, and From Somewhere are all designing with a new aesthetic in mind and producing awe-inspiring results that explode myths that sustainable design is not good design, or that it has a predetermined 'look.'

3. OBSERVATIONS AND RECOMMENDATIONS

In order to develop a doable, appropriate, qualified set of criteria for designers, we must define the areas where we can individually and collectively make the greatest contribution through our work. We need to create a platform to enable dialogue about opportunities and challenges associated with creating products and services that make positive social, environmental and cultural impact.

If we make more sustainable fashion, it must be good enough to replace existing collections rather than adding to the quantity of 'stuff' being produced. Design must be good enough to become re-generative across the three identified areas of social

justice, ecological balance, culture and identity. It is crucial that design understands the issues and responds to the right problems, in the right order. Unless we can identify what is not sustainable, we may be in danger of doing a bad thing well. In the words of Jonathon Crinion, 'we are sitting on a tree, sawing off the branch whilst trying to decide how to replace the plastic buttons.'
Design needs to interrogate its values, skills and knowledge bases. London College of Fashion's Sandy Black has identified these criteria through her research project Considerate Design, where she brings together researchers and practitioners to evolve the factors of considerate design through their work. It is essential that we be grounded in qualified sustainable design knowledge to affect a system shift.

There is no one solution, no prescriptive method. Furthermore, this will evolve and change as we progress, and as style changes in reaction to what it sees. Fashion is always dynamic, it has energy and imagination, inviting innovation, without which societies, businesses and individuals have no impetus to evolve. Crucially, we need a collective change as well as collaborative design through a coming together of a number of players relating to the three areas of concern.

These stakeholders have been brought together by Defra, through their Sustainable Clothing Roadmap, where there are partners in research, education, production, retail, agriculture, technology, waste management and science, who have been brought together through the roadmap process to share knowledge, pledge commitment to change and to undertake research to inform the outcomes of the process.

Recently, the Centre for Sustainable Fashion held the Fashioning the Future Summit, where change makers were brought together to evolve a dynamic and forward thinking approach to sustainability in fashion and to propose new and better ways to design, develop and offer fashion. The overwhelming outcome was a call for a coalition to offer support, integrate knowledge, skills and research so that new systems could be employed that prompt, engage and enable individual and collective innovation. The feedback and results could be accessible both to those involved and then to a wider audience to participate in taking the evolving steps towards sustainability. This coalition/consortium must involve players from across the fashion industry, government, HEIs, NGOs, environmental organisations, investors, media, key individuals and consumers, compounded by strategist Anthony Kleanthous when he said that 'clothing and fashion deliver cultural and functional change.'

Fashion design has a dynamic, informed and informing role to play in achieving social justice through new collaborative design approaches, ecological balance through new methodologies in design and culture and identity through a new design aesthetic. It is with this front of mind that the Centre for Sustainable Fashion will radicalize design thinking and champion a new system for the fashion industry.

Towards a culture of sustainability in design-education

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Key Words:
Sustainability; crafts: design education; curriculum; learning process

Abstract:

This paper explores the issues of 'Sustainability' that affects the immediate environment o f a student's context in an educational institute. The research studies the awareness level of the students on issues of sustainability, examines the initial knowledge and level of understanding of these issues. The paper presents findings of various strategies and linked activities that have been proposed and integrated into the curriculum as an active learning strategy. The research examines the effectiveness of these strategies and tests the understanding and internalization of this issue amongst the student community and academy environment. The findings would help provide an understanding of the sustainability issue prevalent in the educational system and the most effective practices to achieve the maximum benefit from their education.

The guidelines emerging from this research will help students find a platform to vocalize and communicate their beliefs on the sustainability issue into broader societal communities and to ensure that students benefit from a amore healthy and conscious environment.

Introduction

Sustainability is the new frontier of knowledge and research activity deriving global interests and concerns. There is a wide consensus that the world needs to look at sustainability measures to imbibe and to practice if we are to foresee a future for this planet and for the humankind. Fortunately it is possible to make a difference with even slight changes in our day-to-day lives. To ensure that the practice of sustainability be internalized it is important that foremost there be empathy, awareness and understanding of the issues and know-how to implement sustainability practices. Carbon Footprints so carefully measured and discussed have made its presence felt in Boardrooms in the corporate world, in product marketing as a promotional strategy and further on as a trend statement.

Increasing prosperity across the world has allowed many people to enjoy the benefits of goods and services which were once available to just a few.

Nevertheless, the environmental impacts from consumption and production patterns remains severe, and inefficient use of resources is affecting the economy and business. . In India and China and other fast developing economies, the large numbers of wealthy and the booming middle class are at stage one on the luxury ladder, where acquisition means status and excessive equals success. (Shah D; Textile Issue 82)

"What we thought was boundless has limits, and we are beginning to hit them."
Robert Shapiro, (former) CEO and chairman of Monsanto, 1997

If we are to sensitize the generation now to the meaning and create awareness on Sustainability we need to take this issue down to the young students who are going to be the future proponents of this issue. Designers in future will be called upon to deal with complex social, environmental and economic issues and employers will be seeking new kinds of competency. There is also an urgent need for people with an inter-disciplinary problem-solving capability rather than traditional, and often over-specialised, scientific or technical competencies. All of this will have a major bearing on curricula and the processes of learning in higher education.

Why is there a need to create a culture of sustainability?

Students entering the design profession have good reasons to feel optimistic about their chosen career. The burgeoning fashion industry and market demands have ample opportunities for students. A learning environment that keeps pace with global developments certainly would offer opportunities to its graduates that may seem to have an upper edge. When students study in an environment that is synergized with contemporary and future developments, it allows students to have better control over their career plans.

To enable an understanding of present level of awareness of the sustainable issue a preliminary study was conducted amongst the student body at the Pearl Academy. It was interesting to note that the maximum awareness related sustainability to the re-use and re-cycling of material or products. Perhaps this is an aspect experienced by most students having common knowledge of an active market dealing with used products. However majority did not think that craft production or products or organic cotton had much to do with being sustainable. Over all it was observed that saving energy, maintaining eco-balance, bio-degradability were considered as sustainable issues while use of natural dyes, organic food / crops or crafts which is dealt with so closely by a design student during their course curriculum is not considered sustainable. Sustainability was further linked to values and culture of a society besides making optimum use of valuable resources available, to preserve the present resources to enable use in future, consciously reducing your carbon foot prints, designing a product which can sustain for a longer period of time.

Having such wide ranging opinions it is crucial that the knowledge and

understanding of such a major contemporary issue is dealt with at the institutional level ensuring exposure and opportunities for all to discover more on this topic. There is a need to increase the number of higher education courses that include sustainability studies as part of their desired learning outcomes. With the changes in society academic institutions providing higher education need to review and rethink their purpose and modus operandi to ensure the relevance and value of their programmes. New strategies and ways of delivering higher education are emerging, and some encouraging questions are beginning to be asked.

Lessons of Sustainability from Indian Crafts

The design of curriculum in higher education must draw its rationale from its contextual environment. Being surrounded by culture, industry and environment rich in diversity and needs the curriculum which integrates sustainability or social responsibility can adopt a few lessons from Indian crafts. The story of Indian Crafts is a script of assimilation of man's environment into his living space and personal space. It was never meant to be just a personal expression. As in the case of 'bhunga' houses in kutch made of locally obtained mud, grass for thatched roof and ornamented with white mud available from the region are a wholesome example of man's purpose integrating with its surrounding nature. The external and internal space and its use forms a wholistic environment with complete integration of aesthetics, material and purposes.

Products were made for everyday use, products for household, tools and kits for livelihood. Further the making of these developed to fulfill a personal aspiration, the craftsman's expression of his religious beliefs, artistic and personal statements by enrichment through ornamentation for personal clothing or objects of every-day use.

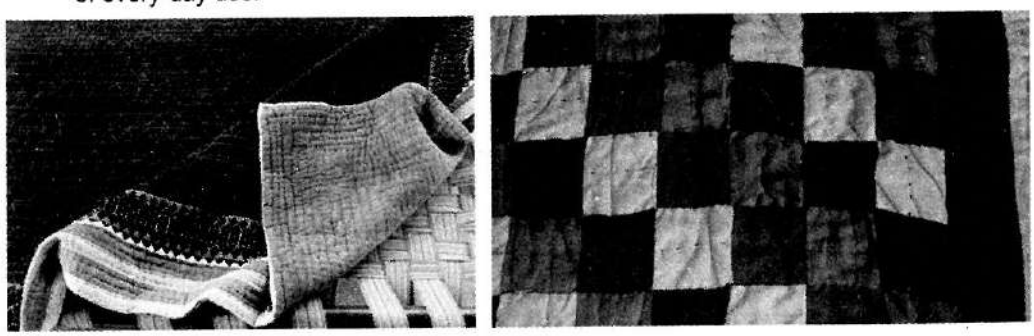


Photo: Jatin Bhatt

Every piece of old, used garment is recycled into another product for an extended use of the material and in the process displays some more exquisite needle craft such as in the quilts from Kutch, Gujarat or Kantha products from Bengal. This quilt is made from an old skirt and has been converted by small running stitch sewn in a defined pattern. Smaller pieces of fabrics are used to

make patch works with great sensitivity to form a pattern. These products originally used at home have been adapted for contemporary markets with great success.

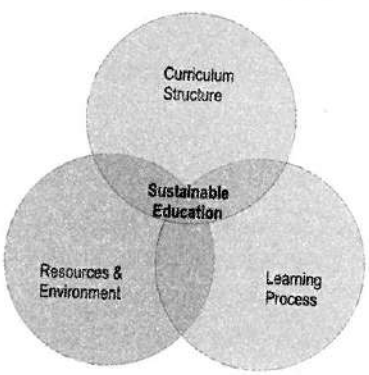
To cite a few practices followed across the country is the recycling of old newspaper. The 'kabadiwala' who provides you at-your-door-service, picks up newspaper, old bottles, plastic ware, even the air coolers, telephone instruments which are no longer needed. There are expert hands who will repair and shine up these products to be sold once again to a hopeful customer who will surely feel he is getting a good bargain.

Role of Education

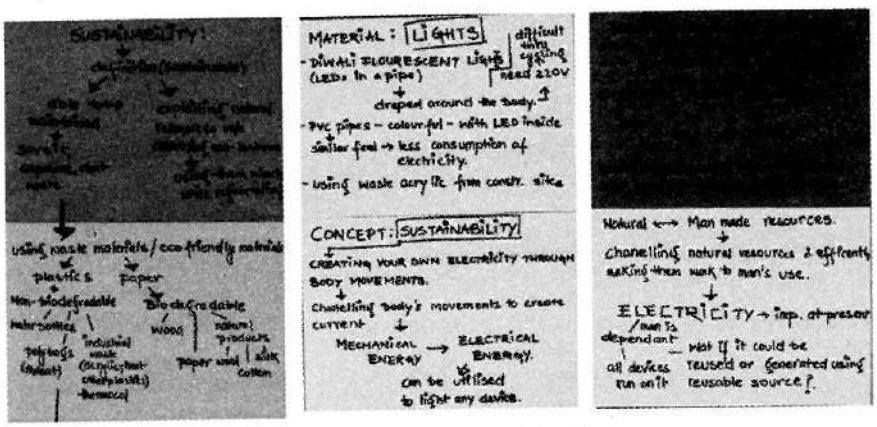
Education plays a broad role in society for educational institutes are micro-cosm of the larger society reflecting its norms, values and aspirations. They also are the bastions of awareness, values, societal consciousness and behaviour. These institutions can become the training grounds for students to determine and practice their personal values and beliefs which will guide them for the remainder of their lives. Experiences, exposures, learning interactions and issues at this stage set the tone of their thinking, values and directions to their future actions. Higher education has the responsibility to not only provide capabilities for employment but also develop attributes that will make a student life-long learner and a responsible contributor to the society. It can provide the ground for developing sensitivity towards sustainability, including the concepts, critical thinking skills to help in decision making and a sense of responsibility for others, for the environment, for society when making personal choices.

If Pearl Academy is to practice, promote this practice then it would be imperative that all adopt, practice and internalize the concept of sustainability. It needs to lead to a culture that is all pervasive, which has permeated into the very fibre of the Pearl philosophy. The practice and internalization of Sustainability as a concept needs to start from the foundation learning. Design often involves turning intangibles into tangibles in complex, constantly shifting, confusing situations, the industry also become involved as part of the process. There needs to be cohesive integration of curriculum structure with aims of the programme. The approach to learning and environment & resources will be added supports in the curriculum.

Sustainability in Design Education



In order to get an initial understanding of the subject area and then to identify ways to integrate it into the present curriculum a small pilot project was taken up. The ongoing curriculum at the Academy was an opportunity to incorporate practices of sustainability to initiate awareness, enable students to research, discuss and debate on what exactly makes up sustainability. Students undergoing a module on 'Costume Design' were assigned a brief to incorporate factors of sustainability to design costumes for a ramp show. Some other activities such as participation by students in competitions to design T-shirts using sustainable material or processes was encouraged. These were just the initial activities to encourage a better understanding. The findings of the study to evaluate the student's understanding of sustainability revealed that most students did not consciously practice sustainability in their practice as design students. Many agreed that the consumption of material, quantity, wastage etc. were taken for granted, while others claimed that they were already quite aware of their social responsibilities and had been using waste, recycling, reusing and saving while practicing skills as learners, but did not have further insight into what and how this relates to sustainable practices.



Credit: Shreya Jain: Process integrating sustainability concept to design ideas

As a fashion design student, the process of visualizing and exploration is perceived as the most wasteful. There is a huge amount of wastage in form of paper printouts, staionary and material usage but overall feel helpless as they associate extensive exploration and visualization process and cannot find any other optimal method to achieve individual results. The subsequent process of 3-D translation or sampling, toile making and presentations are seen as lesser wasteful nevertheless express that it could be made more sustainable.

The findings reveal that most students are comfortable with learning this new concept when it is integrating into the curriculum and would prefer to have a practical hands on exposure to sustainable practices through projects or competitions.. There were apprehensions that a lot of information input will not extend into a real understanding and adoption of such a practice.

The students also were clear that any action now by them will impact their future, as a professional and as a citizen of the planet earth. Most design students equate Design process to problem solving process. If students are to undertake the global concerns and apply the sustainability factor to design then curriculum briefs need to integrate attributes and criteria of sustainability as parameters.

A perfunctory survey of websites dealing with sustainable fashion throws up some innovative and original ideas to re-cycle etc. The new classroom can be the world wide-web which allows a student to be connected to the world, to exchange ideas, debate and discover newer aspects of this concept.

Key suggestions from the findings that emerged were:

- Creating awareness amongst the teaching staff and students, through posters, exhibitions

- Integrating this concept into the curriculum starting with foundation studies without the burden of having to spend time especially for this.

- Adopting sustainable practices in learning processes such as recycling of paper, saving energy,

- Facilitating provision of sustainable material as in a store providing recycled material more where material not wanted could be sold other students at a cost.

- Taking on lessons form the traditional ways of sustainable practices as in crafts.

- Set up a club for this activity which could arrange special workshops or provide platform for debate and discussions.

- Encourage research activities for the staff and students to take on academic research and to find alternative solutions

- Apply sustainable solutions to all supportive facilities and infrastructure.

- Introduce ethics and value understanding as part of professional training.

- Develop guidelines through the discovery process so that there is real seriousness in implementing these practices.

One of the barriers to integrating sustainable development into education provision is that many teachers and lecturers do not feel confident of the about the subject. A combination of uncertainty about what to do, and a feeling of guilt about what is not being done, means that many people seem afraid to expose what they feel is their lack of understanding of sustainability. Therefore, it is often easier to pretend that it does not need to be addressed.

The experience of Costume Design assigned with the brief to integrating factors of sustainability proved to be n opportunity for students and staff to research, discuss and explore resources on sustainability.

Conclusion:

'Sustainability can help students build up their challenges. As students undertaking design process as problem solving process integration of sustainability can engage students with its concepts and build further on aspects application. In the course of work it would enable real life practical experience, and enable internalization of this concept. There will be better appreciation of practices embedded in the traditional and indigenous crafts to look beyond just commercial or cultural aspects. It will encourage students to question, debate and adopt norms, while facilitating innovative teaching and curriculum development at institutional level. It is acknowledged that a wide range of skills, knowledge and attributes are required to create a graduate who is able to work critically and effectively with issues of sustainability. The guidelines emerging from this research will help students find a platform to vocalize and communicate their beliefs on the sustainability issue into broader societal communities and to ensure that students benefit from a amore healthy and conscious environment.

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Plenary Session 2

"Fashion Materials and Sustainability"

PROFILES OF THE SPEAKERS

Plenary Session 2 : *"Fashion Materials and Sustainability"*

KIM GANDHI,
Consultant, UK

Prof. Kim Gandhi has graduated from TIT, Bhiwani, worked in the industry and then joined TIT as Lecturer in weaving for 6 years.

Went to Ethiopia for 3 years , as Head of the department of Textiles, at Bahardar University , with Ministry of Education and Fine Arts, Addis Ababa.

Then joined Department of Textiles, UMIST, Manchester as Research Assistant and gained Ph.D specialising in Weaving. Worked for few years as Production cum Weaving Manager, with Courtaulds ,Chorley UK .

Joined University of Huddersfield as Senior Lecturer (Weaving) , progressing to Principal Lecturer and retired as Director Textile Research. While at Huddersfield, was for few years responsible as Course Director B.Sc (Hons) Textile Technology and Assistant Course Leader B.Sc (Hons) Textile Design, Director, Conferences and Short Courses , Liaison Officer with the textile industry and Chairman, School Textiles Research Committee.

Have published many papers in leading textile journals and presented papers at national and International conferences. Research interests include areas covering Woven Textile Design Structures, Sizing Technology, Technical Textiles.

Professional interests includes active association with the Textile Institute, Manchester for the last 35 years. Currently, member of the Governing Council and Chairman of the Manchester and Cheshire Section of the TI.

At present working as a Chartered Consultant (Textiles)

Visiting Professor at Department of Textile Engineering, UFR, Natal Brazil. helping in structuring a Post Graduate Diploma course in Textile Design.
Visiting Professor , TITS, Bhiwani India.

RAHUL BHAJEKAR
Chief Operations Officer
Texanlab Laboratories Pvt. Ltd.
Thane, Mumbai

An Engineer with a M.S. Degree in Mechanical Engineering from the Ohio State University, USA, Rahul has been with Texanlab since 1994.
After his undergraduate degree in engineering, Rahul worked with Mahindra & Mahindra for one year before leaving for the US. After his return from the US, he worked with engineering major Larsen & Toubro Ltd. for over four and a half years. He was involved in technical marketing for the Special Equipment and Systems Division of the company. He did a brief stint in the Middle East as a product engineer in the automotive sector before joining Texanlab in 1994.

For the past 14 years Rahul has enjoyed working in the field of Textile Testing. Apart from looking after the complete operations of the Laboratory as its COO, he conducts training programmes for Buying Houses and is an active member in the Bureau of Indian Standards and the Society of Dyers & Colourists. He was deeply involved in organizing a number of seminars on Sustainable and Organic Textiles for some of Texanlab's customers and certifying agencies.

He has written regularly for technical journals about Quality Control & Testing in the Textile Industry and has co-authored a series of 14 articles on Colourfastness in the monthly technical magazine Colourage.

Texanlab Laboratories Pvt. Ltd. is India's premier Textile & Analytical Laboratory and performs accredited analysis on behalf of over 40 retailers all over the world comprising some very well known names such as Ikea of Sweden; Tommy Hilfiger; Karstadt Quelle Neckermann; Esprit; Peek & Cloppenburg; John Lewis; Bhs; Matalan; Mango; Target, Australia etc.

Texanlab has built a world-class reputation in the areas of conventional and Ecological Testing. Since March 2007, Texanlab has worked extensively in the areas of conformance testing for the Global Organic Textile Standards.

In September 2007, DyStar, the worlds largest Dyestuff company acquired a controlling stake in Texanlab.

LISA L. HAYES ANTOINETTE
College of Media Arts & Design
Drexel University

Lisa Hayes is an assistant professor at Drexel University in the Department of Fashion Design and Design & Merchandising. She has 18 years of experience as a designer in New York and Philadelphia as a designer for Albert Nipon and head designer for Liz Claiborne Inc. and "Mimi" stores for Motherswork. She currently is a freelance fashion designer and has also done freelance home furnishings design for Anthropologie. Ms. Hayes has travelled extensively sourcing fabrics and production. Lisa has a Bachelor of Fine Arts degree from Syracuse University.

Ms. Hayes' area of research at Drexel University focuses on green fashion, textiles and production as it relates to the future of design. She is currently working on the research, design and production of an entirely "green" sportswear collection. One piece of her collection has been selected to show in the SoReFa

Eco-fashion show in Philadelphia in October 2008. She is a member of Costume Society of America, International Textile Apparel Association and Fashion Group International.

Ms. Hayes has presented papers at conferences such as Costume Society of America and Virginia Association of Teachers conference. She was co-curator for "Inside the Designer's Studio: Bonnie Cashin "at the Leonard Pearlstein Gallery in Philadelphia. Ms. Hayes has edited for Chronicle Guidance Publications, contributed to fashion articles in Mainline Magazine and Curious Parents and has reviewed fashion books for Laurence King Publishing in the UK. She has written a review for the New England Journal of Entrepreneurship to be published in Spring '09.

SEEMA MAHAJAN,
Head of Textile Design, Pearl Academy of Fashion, Delhi

Ms. Seema Mahajan is a professor and the Head of Textiles department at the premium design institute, Pearl Academy of Fashion. She has over 15 years of experience as an academician and a design consultant with various renowned national and international organizations. She has done designing and other consultancies with IWS, DCH, EPCH.

Ms. Seema Mahajan has acquired her MSc in textiles from Institute of Home Economics, Delhi University. She is also a bachelor in education(B.Ed) and a certificate holder in PGCHE, a Post graduate certificate in higher education. Her research interests involve contemporary creative Indian textiles techniques and embroideries. She has also done an in depth research on cotton acrylic towels properties and performance. She is also the member of Society of Dyers and colorists (U.K).

Various articles of hers have been published in textile trade journals.

A.K. PRASAD,
Clairant

- Started his career in production in Century Mills in Textile Production, developed new process of Aniline Black Dyeing for which received 2 patents (1983 to 1986)
- Joined BTRA worked in Technical Services, was employed in Process audits/Process rationalisation/ optimisation, Cost reduction surveys handling problem solving and Development Projects for all major mills.
- Joined Sandoz in 1990 with the textile chemicals business and grew from Technical Executive to the Product Manager to Business Development Manager and to Head of Textile Business in 1997. Today Clariant is a market leader in the industry.
- Now heading the Division Textile, Leather and Paper in new merged company, Clariant Chemicals (India) Ltd, market leader in Textiles and Leather.
- Published more than 100 articles and presented more than 100 papers in major seminars and conferences.

Water ....Water....Water Every Where in Textile Processes Their Sustainability - An Over View

Prof. K L Gandhi
CText, FTI, FRSA, FTA, MCMI
Chartered Consultant, UK

Key words: Textile processes & their sustainability, Water consumption, Recycling textile wastes Seamless apparel, Nanotechnology

Since the last decade or so we have bzeen hearing a lot of about sustainability covering textiles materials and in fact the term has become a bandwagon in the textile industry. It is true that the principles of sustainability have stimulated technological innovations, advanced competitiveness, as well as improve our quality of life.

Textiles their Production and Impact on Environment

There are around 7 billion people on our earth and all wear textiles and equally own large amount of clothings in their wardrobes. Apart from this virtually in each and every room at their home there are textile materials in one form or the other i.e. curtains, sofas, carpets and so on. And then the textiles are used abundantly in offices, transport, hospitals, and hotel industry and in many more sectors.

According to UNIDO industrial statistics database, worldwide- well over 26.5 million people work within the clothing and textiles sectors. It is estimated that 7 % of the total world exports are in clothing and textiles and the world's consumers spend more than US$ 1 trillion worldwide buying clothes. Decades ago the global textile industry was known to create host of serious pollution problems and the reality is that it still creates problems specially in the areas such as:

(a) Water usage.

b) Use of chemicals and dyestuffs including their discharge into waterways, which eventually release, fly ash, formaldehyde, sulphurous and nitrous compounds in the air there by contributing to acid rain.

(c) Huge quantities of wastes that are generated not only during the course of textile process but also later on by the consumers of apparel and house hold textiles.
In UK alone it is estimated that more than 1 million tonnes of textiles are thrown away every year with most of it coming from house hold sources. Textiles make up about 3% by weight of a household bin. At least 50% of the textiles thrown away are recyclable; however, only 25 % is reused or recycled.

Apart from the above problems there are health hazards, too. Textile workers specially working in the spinning, weaving preparatory processes and in weaving

suffer hearing losses and develop lungs problems caused by airborne dust.

Some consumers are prone to toxicity issue when wearing fabrics treated with formaldehyde, flame-retardants and stain repellents. Allergic reactions to some fibres, dyes and finishes are common consumers complaints including asthma.

Textile Chemical Industry

The world textile chemical industry alone is well over US $ 15 billion and produces variety of chemicals products that are used world wide during the course of textile processes i.e. yarn and fabric production, apparel, home furnishing, carpets and rugs, industrial and technical textiles, non woven products and many more. Although some of the chemicals are produced with the aim of contributing to the improvement of living conditions, however a considerable number are toxic and present in the products we wear every day and surely affects many consumers. Bluntly speaking textiles could be considered as one of the most un-sustainable products in the world. Surprisingly in their entire lifecycle from growing the raw material or creating it from oil to manufacturing in the form of fibres, yarns, and fabrics, garments, their selling and final disposal they can create serious environmental problems affecting mankind. However, at the same time textiles and the textile industry have their extreme importance for the welfare of the human beings. Over the years there is a growing concern that regionally, nationally and globally the amount of waste and pollution generated during manufacturing stages of textiles and clothing's, and after wards by consumers certainly need to be reduced on a large scale. As such, efforts are being made to lead the world into the next revolution- an altogether kinder, gentler and restorative revolution thus making journey to sustainability.

Water & The Textile Processes

Although water makes up more than 70 % of the earth and the enormity of the Earth's seas creates a sense of limitless supply, however, the amount of water useable for human consumption is small. Only 2.8 % of the Earth's water is fresh, including 2.14 % that is locked up in polar ice caps and glaciers. Of the remaining 0.66 %, only about 0.3 % is available for human consumption. According to United Nations estimates 1.1 billion people lack access to safe drinking water. There is a population of about 6.7 billion people to maintain and this figure is growing too. Water is essential to all forms of life- human, animal and plants including the industry, particularly "Textiles".

Given the nature of the global textile manufacturing industry, water conservation is of utmost necessary. If every one in the UK bought one recycled woollen garment each year, it would save an average of 371 million gallons of water and 480 tonnes of chemical dyestuffs.

The traditional methods of fabric manufacture i.e. weaving; Knitting, Non-woven and Carpet involve use of natural and synthetic fibres, which have to pass through number of processes to convert them into the fabric form. From fibre to a typical grey state woven fabric, the raw material has to pass through nearly 11 processes and

then If the fabric is to be dyed, printed and finished, it has to pass through another 7 wet processes thus making a total of nearly 18 processes. Interestingly, in almost all the processes there is use of water in one form or another and without it, there would be serious problems in the smooth running of a particular process.

Nonwoven - Processes and Their Sustainability

Compared to the above methods of production, nonwoven process is simple and versatile. Although there are routes involving water, however, choosing the appropriate web forming and bonding method can achieve a completely dry production process of non-woven fabric:The Dry Formed, products can have advantages in terms of cost (no water drying or effluent cost) and environmental impact. Special properties can be built into the fabrics by choice of raw materials, production method, fabric structures and other finishing processes. Some examples for the use of such fabrics are in Horticulture, Building industry, Cable wrapping, Medical application and Filtration. As such, non-woven are an ideal choice for control of water in industrial applications.In textile manufacturing industry, water after having been used in the different processes needs to be kept in its correct form in order to either take advantage of it, or to prevent problems and damages to environment.

Water Consumption in Wet-Processes A

bout 85 % of the water used in textile processes is in wet processing, predominantly dyeing and finishing. In addition to the energy required to heat up that water, about 75% of all the energy and 65 % of the chemical- needed to convert fibre into apparel are used in dyeing and finishing. Around 30 years ago, the water consumption during the process of dyeing a fabric was 72 litres per kg of fabric compared to 4 litres / kg of fabric on present modern high efficiency washing machines.

Water and the Consumers

The water consumption and pollution caused during production of textiles do not finish at the end of the fabric production stage. It continues even further, when the water along with soap materials etc is used by the washing machines. Imagine the amount of water and energy, which is being consumed all over the world by the industrial and home washing machines in different sectors involving use of textiles.

To combat this problem, researchers at Leeds University, claim to have come up with the first water less washing machine, using Xerox technology that tumbles the clothes with plastic chips to remove stains etc. thus achieving the sustainability. Surf Excel has added anti foam agents to its hand wash powder in order to limit the amount of rinses required.

New Products and Processes

A number of new products and technologies aimed to achieve sustainability targets have appeared in the market. Equally, some reputed organisation too has set their goals in this direction. A brief account of few products and technologies is described here.

Seamless Knitting Machines:
Computerized seamless knitting machines combined with Computer Aided Design Technology offer a significant opportunity to achieve 'mass customization' in the clothing industry, without increasing costs and optimizing the material usage thus reducing waste. Currently the market for seamless apparel is estimated to be worth US$ 1 billion.

Seamless appearance apparel can be produced with stitch-free welding techniques. Examples of products made by these technologies include active wear, sportswear, under wear and performance wear.Stitch-free welding involves fusing together layers of fabric by ultrasonic heating, high frequency radiation or bonded adhesive films. These technologies may lead to quicker and cheaper production than traditional methods because less labour intensive cutting and sewing is required. They may also lead to reductions in fabric waste, energy use and noise thus leading goals towards "Sustainability".

The retail price of stitch-free welded garment is normally about 10% more than an equivalent made with traditional sewing but is 15% lighter. A small whole garment can be produced in about 20 minutes by seamless knitting, which is 30 to 40% less time than for conventional cut and sew manufacture.

3D weaving and 3D sewing technologies are other examples of new innovative processes emerging rapidly in the production of whole garments straight from yarn.

Thies Luft-roto plus Dyeing Machine- Saves Water
As mentioned earlier wet processes consume huge quantities of water. To combat this Korea's SOODO Dyeing and Knitting company has invested in two further Thies Luft-roto plus dyeing units to meet today's environmental requirements saving substantial quantities of water and increasing daily out put by 20 tonnes. The new technology has provided the company key economic advantage in minimizing water consumption while maintaining the same dyestuff levels and introducing reduced liquor ratio, apart from reduction in other utilities including steam, electricity and chemicals etc.

Bio-tech based product - " Ingeo " (ingredients from Earth
Based on Biotech, Nature Works PLA (USA) has invented the world's first manmade fibre "Ingeo" derived from CORN, which is put through a simple process to make plant sugars. The sugars are fermented in a process similar to making yoghurt. The fermented products are transformed into a high-performance polymer called POLYLACTIDE, through which the "Ingo "fibre is extruded.

Its production uses 20 to 50 % less fossil fuel and releases a lower amount of greenhouse gasses. It has a low refractive index as such fabrics can be made with deep colours without requiring large amounts of dye.

The fibre is available both in spun and filament forms in a wide variety of counts. The

fibre is used in sportswear, fashion, and some knitwear. The beauty of the innovative fibre is that when the products made from this fibre come to their useful life, they can be returned to the earth.

Bamboo Yoga Eco-friendly Clothing

Designed in association with the UK's National Childbirth Trust (NCT), Bamboo Yoga has launched an eco friendly range of pregnancy and maternity clothing at Mother care using woven fabric from bamboo fibre which is considered to be (a) highly breathable and super absorbent, (b) does not stick to the skin and (c) has natural anti-bacterial and deodorising qualities. The separates are made from 65% unbleached natural bamboo fibre, 28% cotton and 7% elastane. Other examples of the sustainable fibres which have come into the market are EcoSpun polyester fibre made from recycled plastic bottles and Lyocell /Tencel, an environmentally friendly cellulosic fibre that provide softness, durability and moisture absorption qualities.

Nano-technology

Research in novel nano technologies and in biosciences is driving innovation in so called " Smart Function" for clothing and textiles. Application of these technologies has been successfully applied on T-shirt and Carpets. T-Shirts have been applied a stain resistant coating derived from nan otechnology, which is assumed to halve the number of washes required during the product's life cycle. In the case of carpet, the protective nano technology treatment ensures that the carpet's lifetime is extended from 10 to 20 years.

Easy Care Concept

The introduction of an "Easy Care" process during the finishing stage of production although doubles the energy consumption for this process but the benefits from the 50 % reduction in laundering will reduce the overall environment impact by 15 to 30 %. For the end consumer, the effect of reducing the number of washes will be to reduce the need for electricity, water and detergent.

TERRATEX FABRICS from Interface Fabric Group (IFG):

Introduced few years ago, the fabric is widely recognised as the textile industry's most innovative and important stride towards increased sustainability. The fabrics are made to be recycled or composted at the end of their service life- instead of throwing into landfill. The processes involved during the production of the Teretex fabrics are also increasingly sustainable.

CLIMATEX Lifecycle Textiles:

Rohner Textil from Switzerland manufactures environmental textiles for high-end use performance made from patented blend of wool and ramie. The fabric insulates (wool) and wicks moisture (ramie) away keeping the user dry and comfortable. Other innovative products, which are completely compostable, hence sustainable, are Natural Stretch Fabric having the characteristics of an elastic textile, without the use of synthetic stretch yarns and a Moss fabric, worsted sateen fabrics in 14 colours. Virtually no waste is produced during the production processes of the above fabrics.

Suits from Waste

A global fashion innovator and leading mass-market tailored clothing manufacturer "Bagir" is going green by developing fashionable and environmentally friendly suits by using sustainable materials such as PET bottles, bamboo and organic cotton. Their "ECOGIR" collection offers three lines of suits made from organic cotton and suits constructed out of Post Consumer Waste (PCW), which eventually saves energy consumption, reduces carbon footprints by reducing CO2 emissions, and helps divers waste from landfills.

Sustainable Outdoor Travel Bags

Amsonite Out Lab has launched a new Eco-friendly collection of 100 % outdoor travel bags in which all the fabrics used can be recycled. Environmentally-friendly features include : Recycled foam padding, Handles and shoulder straps, Recycled buckles and clips, Recycled wheel housings, Studs, Pull handles with injected wood and use of natural coconut fibre content in shoulder straps.

Organisations leading the way to Sustainability in Textiles Akzo Nobel ICI plan to achieve the following by 2010

- Reduce energy use per tonne of production by 5%.
- Monitor energy use in distribution. Reduce greenhouse gas emission per tonne of production by 5%. Reduce acid gases per tonne of production by 15%. Reduce hazardous substances to air per tonne of production by 25%.
- Water reduce water usage per tonne of production by 10%.
- Reduce Aquatic Oxygen Demand per tonne of production by 10%.
- Reduce hazardous waste per tonne of production by 10% (land waste).
- Reduce non-hazardous waste per tonne of production by 10 %.
- Wal-Mart has declared sustainability to be the gateway towards better business practice and 3 goals have been established i.e. to be supplied by 100 % renewable energy, create zero waste and sell products that sustain resources and environment
- Marks and Spencer sells 400,000 recycled polyester garments by combining piece-dyed fabric with the strong polymer found in used plastic water bottles.

Textiles Consumers and the Waste Generated: UK Scenario

The combined waste from clothing and textiles in the UK is about 2.35 million tons. 13 % of this goes to material recovery, 13 % to incineration and 74 % to land fill.

About half of the UK consumption of products is clothing. Approximately three billion garments are purchased per year equivalent to about 50 items per person.

The major clothing product categories, both by mass and value are Trousers,

Pullovers etc and T- Shirts. Combined, these three categories represent about half of the total consumption by mass. On an average, UK consumers send 30 Kg of clothing and textiles per capita to landfill each year.

" T Shirt " Its Environmental impact

UK consumers buy around eight T-shirts per person each year usually made of single jersey combed cotton. When a T shirt is purchased the buyer must also implies purchasing 1.7 kg of fossil fuel to provide electricity for washing, drying, and ironing during its life cycle.

During the period of owning the T-shirt, 125 g of detergent will be sent to waste water processing. At the end of its life cycle, if it is incinerated, it will be reduced to 3g ashes and the fossil fuel will leave 10g ash. But these are small components of the total waste of 450g sent to land fill, which is made up of primarily mining waste generated during extraction of the fossil fuel.

Better practice in washing of the T shirt and some other clothings has a significant impact on the life-cycle of the product. Washing at lower temperatures reduce all environmental impacts. Elimination of tumble drying, ironing, in combination with the lower wash temperatures leads to around 50 % reduction in global climate change impact of the product.

In 2004, UK imported 460 million T-shirts, valued at around £ 3.2 billion. The finished T-shirts from China were shipped to UK wholesalers, from which they were distributed to retailers. To meet this demand 150,000 tonnes of cotton fibres were needed to produce yarn in the USA. In China 126,000 tonnes of fabrics were knitted from USA yarn. This fabric would have been bleached, washed, dyed and finished before being cut and sewn to create 115,000 tonnes of T-shirts (i.e. about 25% cotton waste arises in production.

Imagine the amount of total waste that would have been generated in the production of 460 million T shirts (just one item) during the stages of fibre, yarn and fabric production and then disposing of the effluents generated during the wet processes. Obviously at the end of their useful life cycles, 115,000 tons of T-shirt then became a HARD WASTE to be disposed off by dumping to landfill or incinerated or recycling.

Reducing Environmental Impact

People's requirement for clothing is physical and aesthetic. Clothes and textiles are required as protection from specific environment or temperature and for hygienic needs and cleanliness. They are also worn to enhance personality, to please others, to conform to a gender, group, or to show hierarchy and to illustrate status in ceremonies. Studies have shown that on the whole the reason people buy clothes are that they want to follow:

(1). A change in fashion.
(2.) Are attracted by low price.

(3). Want to dress for a special occasion.
(4). Are attracted by a brand or label.
(5) Have a regular shopping habit 6. Need to replace old worn out garments. (1)
(6) when the clothes become undersize as time passes specially with children and teenagers.

However, most of us under- use our garments and many other household textiles and these are normally discarded before the end of their life cycle. Over the years efforts have been made to promote sustainable management of clothing and textiles products by extending the life of the garments and other household textiles prior to their disposal as waste in the best interest of the environment. Some of the measures being taken are:

Leasing Clothes Instead of Buying Them

Initially the idea of leasing clothing rather than purchasing it seems unattractive to many consumers. However, for some clothing and textile products leasing is already common practice. Examples of leasing include: formal and evening wear; maternity clothes; school uniforms; sports clothing; linen for restaurants or hotels; uniforms for hotels; protective clothing in industry; wedding clothes. Typically such uses are either for work or for a specific short-term purpose, so the consumer does not feel an emotional attachment to the product. Leasing is an effective way to use products for more of their potential life and gives cheaper access to special clothes for short time-for ceremonies, or to follow rapid changes in fashion. The cost per outing of a garment is also reduced.

Second-hand clothing

The second hand clothing market is worth $ 1 billion per year. The idea of taking used clothing to a charity shop or clothing bank is well established in UK and the largest organisations involved in the collection and processing of second-hand clothing are : (a) Recyclatex, (b) Oxfam and (c) Salvation army, besides others from the Textile Recycling Association. Around 30 % of clothing disposed in the UK is collected in this manner. Of the remaining 70 %, it is either sent to landfill or incinerated or is baled and sold on a commodity market abroad to Eastern Europe, the Middle East or Africa.

Recycling Textiles to Create New Products

A small fraction of the collected textiles, which cannot find any alternative use, is shredded and converted into wipes or carded and mixed with other fibres to be re - spun into yarn and then to fabrics.

A Students Project Cotton From Blue to Green,

A Denim drive was launched two years ago as students run campaign to educate them about their favourite cotton clothing- Denim. The green project afforded the student community a chance to make an impact on the environment in their own unique way.

Students collected a total of 14,500 denim pieces nationwide on their college campuses and surrounding communities. The pieces were sent for recycling and finally prepared the denim to its original fibre state cotton. This was then used for manufacturing of environmentally safe natural cotton fibre insulation, which subsequently was used to insulate 12 new homes that were built for the families affected by Hurricane Katrina in 2007.A number of projects have also been launched in the last few years to recycle some old clothing into new garments. Typical example is the creation of women wear collection made from recycled exquisite Saris, into skirts, quilted jackets, halter neck tops and dresses etc as well as household products such as lampshades and decorative pieces e g hand bags.

Carpet Industry Waste Generated and Sustainability The global carpet industry is large and is mainly dominated by the United States and Belgium manufacturers who account for about 50 % of world's productionIn USA,230 plants located in 21 states employing 70,000 people produce almost two billion square yards of carpet and is an $ 11 Billion industry. Europe alone produces more than 1 Billion square meters while the UK produces nearly 150 million square meters.

Nearly over half the annual carpet production is used to replace used carpet as such about a billion lbs of fibres is land filled by way of used carpets. Such carpets generally are heavy contaminated as compared to industrial carpet. Over 27 million kg of annual waste is generated by the carpet industry in Dalton USA. Western Europe carpet industry generates nearly 1.6 million tonnes of carpet waste, representing a total surface area of 900 million square metres (equivalent to 200,000 football fields). 70 % of it ends up on landfills and 30 % is incinerated as municipal waste. UK carpet industry waste from manufacturing and fitting operations is estimated to be about 10.5 million square meters. Majority of this is landfilled at a cost of about £ 750,000 and the rest is incinerated. Incineration is the burning of waste materials under carefully controlled conditions. The process converts the waste into ash, flue gases, particulates and heat, which is then used to generate electric power. Incineration reduces the volume of the original waste by 95 % as such greatly reduces the amount that is sent to landfill.

A New Technology Gasification

This is a new technology which is in its infancy but is regarded as a clean way of disposing of waste while simultaneously generating energy. The process burns the waste and turn it into gas by burning it at high temperatures without oxygen. The waste is put into boxes and then incinerated after being starved of oxygenate resulting mixture is called "synthesis gas " or "Syngas" and is itself a fuel. The process does not result in any air borne particles being released into the environment.

Disposing of Carpet Waste- its Destination ?

Over the last decade or so the carpet industry worldwide has devoted serious efforts into finding the best methods of disposing of the carpet waste. Most of the major manufacturers of carpet and face fibres have committed many sources to developing processes for recycling and managing post-consumer and post

industrial fibre waste employing different options such as:

Direct re-use, Refurbishment, Recycling fibre into other plastic products, Recycling carpet backing into new carpet backing; Carpet to-carpet recycling.

Recycling involves processing used materials into new products in order to prevent the waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (and water pollution (by reducing the need for "conventional" waste disposal, and lower emissions as compared to virgin production.

Typical example of this is that the Miliken Sand Company's Earth Square Renewal Process recycles carpet tiles to be reused by deconstructing the used carpet tiles and then reconstructing them in new pattern and new colors. This considerably reduces Landfill waste and provides the customer with "NEW" carpet at about half the price of truly carpet.

Eco-Carpets

Eco- carpets are another example of textile remanufacturing, where carpets are taken back to the original manufacturer to be cleaned, texturised, reprinted and cut into carpet tiles for reuse in a new location. A new conventional carpet consumes five barrels of oil / 100 meter squares while manufactured tile carpet consumes 1.2 barrels, including transport.

Non-Carpet Products

In addition to all carpet related products, attention is being focussed on non-carpet products containing post consumer and post industrial materials derived from the carpet. Many new innovative products are being produced such as:Adhesive-free, flooring tiles, Archery targets, Auto parts, Carpet cushion/pad, Concrete wall board, Counter tops, Extruded molded products Fiber, Fireplace surrounds, High performance carpet tiles primary, backing, Home insulation products, Landscape elements, Plastic lumber, Plastic plywood, Plastic wedges, Sand bags, Sinks and bathtubs, Styrofoam ,Sod reinforcement tiles, Tabletops, Water and energy conservation products. The new nanotechnology applications applied by the polyamide yarn manufacturers doubles the life span of a carpet thereby reducing the global environmental measures to about 55 % of the base case values.

Water and The Carpet Industry

Finishing and dyeing of carpet traditionally uses a large quantity of water. Environmental responsibility has resulted in companies finding ways to consistently reduce water usage. Innovation and conservation has allowed some mills the ability to save as much as 22,000 gallons of water per day to process each 1,000 square yards of carpet. From 1995 to 2002, the industry on an average has reduced the amount of water needed per square yard of carpet from 14.1 gallons per square yard to 8.9 gallons per square yard. This comes at a time when industry production also grew about 42 percent over the same period.

Fashion / Design and its Partnership with " Environment ":

Fashion by the name itself is not designed to last long. Fashion conscious consumers wear garments too little; wash them too often and at too high temperatures. Fast fashion has lead to fast generation of the waste. Globally the rapid rise of fashion in the past few years has increased the flow of textile material and the garments are worn fewer times before their disposal. Fashion garments generally are less easy to repair. For fashion garments, on the whole the tendency on the part of the fashion garment manufacturer is to use numerous material types and extensive use of fibre-blends, which cause problems in their recycling. Globally, volume of clothing's purchased have increased in the last five years and a weight of clothing and textile equivalent to about three quarters of purchases is dumped at land-fill.

With due respect to fashion designers, they don't always understand the manufacturing processes and appear unaware of the negative effects on the environment caused by their design decisions. Manufacturers by contrast, see designers as a weak link in improving environmental performance because lack of their insufficient knowledge of textile materials and production processes.

Ideally, designers should be able to identify and assess stages in the design process that impact significantly on the environment and be aware of appropriate changes in materials, processes and disposal routes. They need to know what can and what cannot be recycled if the fibres are mixed together when they to want design any fabric.

Eco-Textile Design and Fashion Education

The author has spent his life in textile education teaching Textile Design and Technology curriculum's and feels that there is strong need to make appropriate changes in the design education to ensure that the course curriculum's provides the designers a clear understanding of the materials and the technologies they use when designing their products on environment. The curriculum should encourage them to use recycled materials into their project work etc. Over the last few years, environmental education has now been introduced even in primary and secondary educations said in the beginning sustainability is a term, which is being used widely, but I stress that we consider " it means in practice for future development ". There is pressure on our water and energy supplies and we are running out of landfill for waste disposal. The world population in 1950 was only 3 Billions and by 2050 it is expected to increase to 9 Billions. If we are to achieve " sustainability "- maintaining a fully functioning environment while also delivering a good quality of life both for today and for future generations, translating this philosophy into a reality, we will all have to make some radical changes and sacrifices- and quickly too. We must decide what it is that we want to achieve and how we will achieve it. Certainly, all of us the companies and the private individuals need to make a difference. We must act globally as well as locally. There are, of course, no easy answers, but with the right blend of technologies, regulations, environmental "taxes" and cooperation from the

consumers the challenge to Sustainability is achievable.

Most experts believe that in 50 years time the hot climate change universally will result and predict that the temperatures will rise by two degree Celsius. If this happens, with 9 Billions people living on this earth, it will profoundly influence the way we will live and use textiles and generate waste etc. In my opinion sustainable textiles would be at the heart of our future civilization. Apart from our own responsibility, we owe to the future generations ie designers, technologists, and engineers in textiles to do every thing possible to achieve the final outcome ie.

"DESIGN AND DEVELOP SUSTAINABLE TEXTILES".

"Concept of sustainability & evolution of ecological parameters in Textiles".

"sustainable textiles today's burning need"
"The need for sustainable textiles"
"sustainability and textiles a necessary bond"
"why sustainability in textiles ?"
"evolving global environmental & sustainability concerns in textiles"

Rahul Bhajekar
Chief Operations Officer, Texanlab Laboratories Pvt. Ltd.

SYNOPSIS

Hundreds of Chemicals are used by us in our daily lives, from sunrise to sunset. These include everyday items such as hygiene products, office and school goods, to lifestyle products.

Many of these chemicals are synthetic. And they are not so old. In the history of this world which is estimated to be 4500 million years, human beings have been around to less Than 2 billion years.

For centuries Humans and Animals lived with nature asit existed until the creative human discovered oil. The distillation of petroleum gave humans the ability to synthesize chemicals which did not exist in nature. It has been only151 years since the first synthetic dyes tuff was discovered by William Henry Perkin. This discovery is considered to be one of the major influences in development of Organic Chemistry.

Organic Chemistry has allowed Human Beings the luxury of many lifestyle improving products such as new fibers, pharmaceuticals, insecticides, pesticides, plastics etc.

But how much has this lifestyle improvement cost us? Recent news and research has Shown that 150+years of the senew chemicals have ledto extensive damage to our health And to the environment.Global Warming, OzoneDepletion, Allergies Cancer, Immunity and Genetic Disorders, Dying animal species, reproduction. For thousands of years, human population was practically constant in the world. It has exploded 10 times in 300 Years. Also, Chemical production has grown 400 times in 70 years.

Europe and European Countries have been at the forefront of development and Production of chemicals since the early days. It is also interesting to note that five of

the World's chemical giants were situated either on the western European river, Rhine or one of its tributaries. On its way from the Swiss Alps to the North Sea, it travels through Switzerland, Germany and Holland. In the early days, large European Chemical Companies discharged chemicals in to the river. It was little wonder that Western Europe Was the first to realize the harmful effects of the chemicals that it was producing.

Persistent organic pollutants have been found in human blood samples and ordinary House dust. Residues of Chemicals such as Flame Retardants, Alkyl phenol ethoxylates, Short Chain Paraffins, poly chlorinated biphenyls, Organotins and Phthalates have been found.

It is also interesting to note thatover100,000chemicalswere listed in Europe as of 1981(Of which 30,000 were in production). About 4000 more chemicals have been registered after 1981.Out of these 34,000 high production volume chemicals, only 3% a re estimated to have full data about their harm full effects. Some have partial data and an estimated 15% Of chemicals have no data at all.

This means, the human race is today using chemicals daily where their ill effects are not known.

It is quite obvious that if we are to continue this practice, there will be problems. Recognizing this, since the 1970's different conventions and conferences have tried to address the problem. We have all heard of the Kyoto proto colon green house gasses and the more recent 2007 Bali summit which are still dead locked.

TheTextile Industry, Ecology and RSLs theTextile Industry is considere done of the most polluting and therefore has got enough Attention from all.

Different approaches have been taken by governments and individual corporations. European countries passed laws restricting use of certain chemicals. Eco Labels came up And promoted their own criteria for "green"products.Governments also have come out with their own ecological labels, such as EU Flower in the EU, Eco-Mark in India. Individual companies saw this as an opportunity for better customer connect and have in turn come up with their own lists. These lists are called Restricted Substances Lists, or RSLs.

RSLs are a list of chemicals that are restricted for use either by legislation or voluntarily by a Retailer. These apply to all consumer products that the Retailer markets and they are intended to protect the consumer, the production centers and importantly, the environment.

Why do Retailer shave RSLs? Apart from the fact that legislation has ensured that some harmful chemicals are restricted in use, Retailers have found them a good Consumer Connect tool. Also, the Green Movement is quite strong in most of the developed world. An environmentally friendly product is rated higher than

its"unfriendly"contemporary. The media constantly bombards consumers with information about what is friendly and what is not. Products that do not match requirements are immediately exposed to the to very bad publicity and loss of business.
Retailers are therefore very careful and their RSLs are normally far stricter than legal requirements. Their policies towards eco parameters reflect their commitment to this cause.

All of these lead us to one conclusion–The Environment is Important. To the Retailers and to us. Consequently, restrictions on chemicals are here to stay. And requirements will
Keep changing.

Processors, Manufacturers and Suppliers need to understand the requirements, comply with all legal demands and always be aware of any changes in the same. It is important to convey all requirements down the supply chain and set up out a quality system that works.

Organic Textiles

The demand for Organic Textiles has been phenomenal in the past few years. The very reason for this seminar is the tremendous interest in this area. The growth of organic Textile systems from the basic need to work on sustain ability.

The continued use of these chemicals in all industries, especially the textile industry including cultivation of cotton (which is estimated to consume about 25 % of all manufactured pesticides in the world) has led us to a stage where the harmful effects are

Being seen by every one. Environmental damage – Acid Rain – Green house Gases – Global Warming–Loss of habit at all have been smeared with the use of chemicals.

Little wonder that we are going back to our roots – closest to how we lived 200 years ago – a sustainable existence with nature and the environment. Not without modern Conveniences, but living in harmony – giving up a few things and controlling the chemicals we use.

The interest in Organic Textiles has been born out of this desire. Consumers recognize the need for sustainable existence and Retailers are trying to fulfil these obligations – For Business and for the environment.

Almost every retailer either is running anorganic programme or is thinking about it. No doubt that the green movement, global climate change, warming and efforts like the Oscar Award winner "An Inconvenient Truth"are fuelling this change. The common citizen is more aware of the environment. Education at school level is also contributing. Our Children know more about degradation of the earth's natural

resources than us. A sure movement towards a better tomorrow.

GOTS is the culmination of the efforts off our organic certifying bodies. It is an on-going process of change for the better.
However, as world citizens, we all need to rise to the challenge and help clean up our planet. We need to passion a good legacy to our children. For a better tomorrow.•
"EVOLVING GLOBAL ENVIRONMENTAL & SUSTAINABILITY CONCERNS IN TEXTILES"

Innovation in Synthetic Fibers and Textiles: Moving Toward a Sustainable Future in the Global Fashion Industry

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Key words: sustainability, Teijin, Nuwa®, fashion and recycled polyester

Today's eco-fashions are based on combining ecological and ethical principles with concept innovation and a high level of design aesthetic. Whether made from totally organic cotton, recycled vintage fabrics or designed for less waste and longer life, a new wave of stylish designs is changing the way sustainable and ethically sourced clothing is perceived eco-fashion is becoming chic!

I. Introduction

Companies around the globe are making important advances and innovations in the area of synthetic fibers, fabrics and finishes. The once popular notion that only natural fibers are good and that synthetic, artificial or chemical are bad does not reflect the current mind set of sustainability in today's global fashion supply chain. Despite their origin being petrochemical based, some polyester and polyester fleece fibers, textiles and garments may have a higher level of sustainability than many other fibers, including some natural fibers. This is especially true for garments and fabrics which originate from recycled fibers.

Recently, a number of pioneering companies around the globe have begun utilizing innovative processes at each stage of production to reduce the environmental impact of the garment industry. For example, synthetic fiber producing companies are employing the recovery of textiles and post consumer waste for recycling into new fibers and fabrics. Textile manufacturers are committing to employing new methods for weaving and finishing or developing new methods of garment production which reduce their environmental impact. Finally, garment producing companies are helping to alleviate the mountains of waste that are overflowing landfills by recovering their own fashion products for reuse and recycling. These cutting edge synthetic fiber and textile technologies are playing a major role in building a new vision for fashion sustainability while still maintaining a high level of style.

II. Reducing the Volume of Material in the Waste Stream Through the Recycling of Consumer Byproducts

A. Recycling of Consumer By-Products into New Fibers

Teijin Fiber Ltd., an innovative fiber company, is reducing what enters the waste stream by focusing on recycling materials such as polyester. Teijin is focused on

three main businesses: polyester raw material, polyester fiber business and textiles with polyester as the mainstay. The definition for polyester, as found on Teijin's corporate website, reads as follows:

Polyester is a manufactured fiber in which the fiber-forming substance is a long chain of synthetic polymer containing an ester (a compound formed from the reaction between an acid-in this case, carboxylic acid- and an alcohol). Polyester fibers, polyester films, and polyester resins are used in a wide range of everyday items, including apparel, PET bottles and audio tapes.

Teijin, which developed the progressive EcoCircle® fiber-to-fiber recycling system, began recycling PET (polyethylene terephthalate) plastic bottles for use in textiles and other products more than a decade ago. The process of the recycled polymer PET was first introduced in the United States in the early 1990s under a brand called "Ecospun." Some mills and vertical retailers such as Polartec and Patagonia are big supporters of recycled textiles. Teijin is a frontrunner in the recycled textiles field and operates a textile-to-textile, bottle-to-bottle and film-to-film chemical company.

PET recycling is the backbone of Teijin's innovative polyester business. Teijin's recycling facility, which has an annual capacity of an estimated 72 tons, or 158 million pounds, utilizes advanced technology allowing it to transform polyester, polyester blend apparel, PET plastic bottles and polyester film into a terephthalate dimethyl, or DMT fiber called ECOPET®. This fiber can be used for environmentally friendly products requiring green procurement and Eco-Mark products. Teijin's chemical recycling process cuts energy use by 84% and reduces carbon dioxide emissions by an estimated 77% (in Japan) as compared to the production of DMT directly from oil. According to the Japanese Chemical Fibers Association, Teijin is one of seven major fiber producers in Japan that recycled a combined 65 million pounds of PET bottles (an estimated 29,500 metric tons) in fiscal 2006. This number is almost double the level of recycling achieved in 2001. According to Teijin, there are some drawbacks to this process. First, this process can't be used to produce filament fibers, only staple fibers. Second, there are color limitations for the finished fiber -- pure white is not possible for the polyester fibers made from the PET resin. Finally, there are also limitations in yarn size and therefore there are no fine denier yarns yielded from plastic bottles in post consumer waste material recycling.

B. The Creation of New Fibers Through the Recycling of Used Garments

A number of mainstream clothing companies are pioneering the use of recycled fabrics from manufacturers like Teijin. Teijin developed the patented EcoCircle® fiber to fiber recycling system to keep products out of the landfill and trash incinerators at the end of their useful life. This is only one example of Teijin's commitment to develop technologies that are beneficial to the environment and to people. Initially, the program started with one uniform company but it has since expanded to three major garment companies.

One company that participates in such a fiber to fiber recycling program is Patagonia. In August 2005, Patagonia became one of the first global companies to launch a garment take-back recycling program -- the Common Threads Recycling Program. This revolutionary program relies on Patagonia customers returning their old and worn-out Capilene® (100% polyester) base layer garments to Patagonia, via mail or at any of the retail stores nationwide (preferably on a trip while running other errands). Capilene® is a smooth jersey (knit) base layer or long underwear layer fabric with a special internal grid structure which is meant to help retain warmth, wick moisture and breathe. For fall, the 2008 REI catalogue describes the Patagonia solid color turtleneck style in Capilene® as 92% polyester, 54% recycled and 8% spandex, while the heather colors are described as 93% polyester, 47% recycled and 7% spandex. The returned products are then transported via container ships (which otherwise would go back to Asia empty) directly to Teijin's facilities in Japan. Currently, there are about 10,000 metric tons of garments per year collected for recycling out of approximately 40 million metric tons that consumers use each year. The facility accepts whole garments which can contain 10-20% other fiber. This fiber to fiber recycling program produces high quality fibers that can be used in many fabrics.

The fibers produced from recycled garments and fabrics are of the same high quality as those which are virgin polyester. With EcoCircle®, discarded and worn-out polyester garments are recycled into virgin-quality fibers. The process breaks down the fabric to the molecular level and creates a new polyester raw material. The recycled product is heavy metal free, and this particular DMT is of the same quality as virgin DMT material derived directly from oil. The recycling program, therefore, reduces the fuel-based inputs needed to manufacture polyester while at the same time eliminating waste. This means that the fabrics or garments made from the recycled polyester can be the same quality as those from virgin polyester with a reduction in energy consumption and waste. According to Patagonia, the making of new polyester raw material from used garments returned to Patagonia and then recycled and reprocessed by Teijin results in an energy savings of 76% and a CO2 emissions (greenhouse gasses) reduction of 71% compared to the raw material produced from virgin materials. Patagonia announced in January 2007 that they planned to "close" their recycling loop by 2010, and have a completely recycled apparel line. This would mean that every piece of clothing that Patagonia makes will be made from recycled materials and be recyclable. This process, however, is not perfect. Customer participation is voluntary, and recycling alone will not cure our environmental challenges. More and closer recycling plants are needed to increase savings from the actual recycling and alternate energy sources and shipping methods are needed to reduce the environmental impact of the transportation. Regardless of the room for improvement, this is a groundbreaking program in which many other companies can participate to lower the negative impact of textile and garment production on the environment.

Another example of a company that participates in a similar recycling effort for their textile production is Polartec. Patagonia is partnering with the makers of Polartec to

produce recycled fabrics. Polartec is a world leader in the production of eco-friendly and recycled-content synthetic fabrics. In 2008, 20% of their total production is projected to be in recycled content fabrics with an even bigger percentage planned for 2009. There are many well known companies that currently are using the recycled content fabrics manufactured by Polartec such as, among others, Aigle, Berghaus, Eider, Lafuma, Lowe Alpine, Prana and Quicksilver.

Polartec, which is located in Lawrence, Massachusetts, was originally known as Malden Mills. Malden Mills was the first company to develop synthetic "fleece" under the brand name Polarfleece, which is normally 100% polyester. In the laundry phase, Polartec fabrics use less energy. They require no ironing, and do not absorb water so they do not require tumble drying. The energy used to care for polyester is much lower than conventional materials. Since developing an exclusive double-faced fabric named "Synchilla" in 1987 with Patagonia, Malden Mills has adopted Polartec as the company's name. They have manufactured about 300 different fabrics based on the original synthetic fleece. Polartec offered its first recycled synthetic fabric in 1993 in the name of sustainability.

Polartec announced in March of 2008, that they are entering an agreement with Bluesign® Technologies AG for a detailed on-site evaluation of textile manufacturing according to the five principles of the bluesign process. These principles of the bluesign standard include resource productivity, consumer safety, air emissions, water emissions and occupational health and safety. The bluesign initiative along with recycled product development and renewable textiles represents Polartec's ongoing Eco-engineering program committed to reducing the company's environmental footprint. Bluesign® Technologies AG was founded in 2000 and since then its bluesign standard has been adopted by various leading players in textile manufacturing as well as by chemical companies such as, among others, Schoeller Textil AG, Formosa Taffeta CO. Ltd., Everest Textile CO., Ltd., Huntsman Textile Effects and Clariant International Ltd.

III. Sustainable Methods of Manufacturing Fibers and Producing Fabrics

A. Synthetic Fiber Development

A number of companies are employing new weaving, dyeing and finishing strategies in textile production to reduce their negative impact on the environment. Teijin is one such company that uses a new sustainable alternative to the dyeing process. Teijin produces textiles with the science of biomimicry such as Morphotex® which is a result of nanotechnology. The fiber optically generates color without using potentially harmful dyes. There are other new developments underway such as Unifi's "Repreve" which is a 100% recycled polyester fiber from post consumer and post industrial waste. There is also a recycled nylon in development called "Recyclon" which involves a much more challenging repolymerization process.

In theory, it is polyester, the synthetic which can easily be reprocessed into chips to start the process again, which should be infinitely recyclable if handled correctly. Today, Teijin has become a frontrunner in the field of chemical recycling for textile to

textile, bottle to bottle and film to film recycling of polyester. Teijin is a multinational enterprise, comprised of nearly 160 companies in seven business groups around the globe, including textile fibers, industrial fibers, films, plastics, medical and pharmaceuticals, fiber marketing products and IT, whose headquarters are located in Japan. Their global production network and product development capabilities center on polyester fibers in response to the increasing awareness of environmental issues and new demands on the industry to provide ethical and sustainable alternatives.

Companies such as Nuwa® Textiles are innovators in the field of environmentally friendly textile, as opposed to fiber, manufacturing. They have a dedicated textile engineering team and they employ a variety of strategies including efficient energy use, dyeing machinery that minimizes water usage, emissions recycling and outflow filtration. These efforts result in environmentally sound certifications such as Oekotex® and Bluesign®. Nuwa® is a Taiwanese-American company, under the leadership of Michael Shih, a third generation president. Larry Harrison, the company's vice president, hopes to achieve complete transparency in operations so that the customers they supply with fabrics can be confident that all of the fabrics will suit their social concerns, production goals and fashion forward textiles. Nuwa® Textiles is one of the first companies to offer environmentally friendly cleaner polyester and nylon through advanced technology including a complete line of recycled polyester. Careful engineering of the manufacturing process is one of the things that sets Nuwa® Textiles apart. Making textile manufacturing more sustainable is the main goal of the company- creating high end specialty goods produced with lower environmental impact. Green manufacturing should be the new universal standard.

B. Sustainable Manufacturing of Textiles

Nuwa® stands behind its commitment to sustainability, even at a considerable cost. Nuwa® is one of the largest weavers in the world and currently leads the way in setting new standards in cleaner textile production. They employ custom designed machinery to reduce water consumption and energy while delivering new eco-friendly fabrics to specialty manufacturers around the world. The company produces 20 million yards of fabric each month. Weaving is ISO 9001, 14001, and 18001 certified. The dying plant is Oeko-Tex® and Bluesign® certified. Bluesign® staff on their most recent visit noted that water usage at the plant, 101 liters of water per kilo of fabric, was below the 150 liter per kilo standard used by companies employing the industry's best practices. These certifications are very expensive for Nuwa®. For example, two of the ISO costs are approximately 55,000 and 35,000 Euros per year alone. Nuwa® leads the way for this level of environmental action in the manufacturing of textiles.

Nuwa® furthers its commitment by sharing what it has learned with other companies. They are sponsors of FabricLink.com and Textile Insight Magazine's bi-annual panel discussion in the United States called "Eco-Logical" Making Sense of the Supply Chain Certification. Nuwa® also sponsors its own "Project OR" where 5

top design students are chosen to participate for a three-day competition, similar to the Project Runway concept, to create an innovative "green" concept and project using their own line of fabrics. Nuwa's® line consists of many innovative coated fabrics which can utilize sealed seams. The current range of fabrics is aimed primarily at the outdoor market. Within the confines of a commercially responsible company, Nuwa® remains committed to achieving transparency in manufacturing through the use of technology, innovation, and improved efficiency in an attempt to halt the assault on our planet.

Nuwa® Textiles takes its inspiration and name from the world's first environmentalist, the ancient Chinese goddess Nuwa. Nuwa, the creator of humanity, stood before the four corners of the fallen and torn sky. The water god, Gong Gong, and the firegod, Zhu Rong, engaged in battle, tore a hole in the firmament. The forests burst into flame, water flooded the lowlands, and the dragons and other fantastic beasts attacked. Mortals were defenseless. Nuwa, grieving for her creation, thrust her fist deep into the earth. She mended the sky with a molten mixture of precious stones and jewels, and propped it up with the legs of a giant turtle she had slain, rescuing her beloved populace. The world was safe once more.

Nuwa® Textiles strives to be an eco-steward for generations and products to come in the textile industry.

Nuwa® is not alone in the effort to utilize sustainable manufacturing technologies. Companies such as Sonobond® Ultrasonics are pioneering manufacturing methods in garment construction. For example Sonobond® has developed the SeamMaster™ High Profile Ultrasonic Bonder for use with fabrics that are at least 60% synthetic. Ultrasonic bonding, which reduces energy and material usage, occurs when high frequency acoustic energy is converted to mechanical vibrations, then channeled through a horn, which creates a rapid heat buildup at the material contact point. Ultrasonic bonding also requires no thread or adhesives and can emboss and seal in just one pass. There is no fraying or unraveling of seams with this method and the construction process takes less time. Production speeds are up to four times faster than sewing machines and up to 10 times faster than adhesive methods. This method of production, which has previously been used in other (non-clothing) product areas, uses less energy than conventional sewing machines.

There are many diverse textile applications for ultrasonic bonding, which bonds with no consumables or wasteful by-products. Medical disposables assembly, filtration assembly and body armor assembly are some of the current most popular uses for ultrasonic bonding. Nearly every major ballistic vest and body armor manufacturer in the United States uses ultrasonic bonders. Because ultrasonic bonders seal and cut in just one pass, there are no holes or glues to prevent leaking, thereby producing ballistic vests that comply with the current National Institute of Justice submersion tests. Ballistic vests become penetrable when wet and, therefore, must be contained in a waterproof shell. Ultrasonic bonding can also be used in high end

fashion and performance garment production as long as the content of the fabric is at least 60% synthetic. Many of the Olympic uniforms, primarily swimsuits, for the summer 2008 games, were manufactured using bonding. Other apparel uses are synthetic intimate apparel and performance-wear. Ultrasonic bonding provides cleanly cut and hermetically sealed edges of synthetics and non-wovens in less time and with fewer waste by-products.

IV. Reducing the Volume of the Waste Stream Through Reuse of Finished Garment Products

At the end of the lifecycle, there are companies making inroads in sustainability by focusing on collection, reprocessing and reusing their garments. Uniqlo, Japan's largest casual wear manufacturer-retailer collects their used clothing twice a year for reuse and recycling. In March 2008, they collected an amazing 910,000 units (compared to September 2007 when they collected 140,000 units). These efforts reduce consumption in the short term. Some are recycled for wiping cloths and shredded for filling materials while the majority is shipped to Eastern Europe and Africa for reuse. The reuse of textile products "as is" saves the environment a great deal and uses less energy than reprocessing a garment back into the fiber state. It takes 10-20 times less energy to sort and distribute used items as it does to produce new ones.

The above examples are ways that companies are involved in promoting sustainability in the fashion industry. These advances in the development, manufacturing and recycling of synthetic fibers, fabrics and garments are integral components to achieving sustainability in fashion. Designers, along with other professionals in all aspects of the apparel business, need to identify and target areas within the production chain in which they can implement these processes. Given that the apparel business is the most pervasive form of commerce in the world, the fashion industry has the ability to dramatically reduce the negative impact on the environment through the use of sustainable processes.

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Alps industries-where growth is not a choice- it is imperative

"Sustainable growth is not a destination but a never ending journey"

Seema Mahajan
Head of Textile Design, Pearl Academy of Fashion, Delhi

Alps industries have become the most dominant species on the planet- they have achieved stupendous success in the industry, technology and communication: they have created wealth for hundreds of millions of people that were unimaginable a couple of centuries ago. Alps have grown in number to about six and a half billion: have reduced the gap between the rich and the poor: and have created environmental and sustainability challenges across the world.

Alps Industries were established in 1962 as a small handloom unit with just 4 looms with a capital of about 30000 rupees. In the second phase they moved to bigger premises, with about 100 handlooms and began supplying it to some of the furnishing industries. In the year, 1972, Alps became a private limited company and in 1974 they started exporting their products in Europe and USA .In the year 1988, they entered into the branded architectural product segment with VISTA as one of the pioneering brands in the Indian market.

Throughout the beginnings and growth phases of Alps they have always tried to minimize waste, maximize efficiency and adapt environment friendly policies.

Alps became a public limited entity in 1993 and the following year, they entered into the spinning and weaving segment. In 2005-06, Alps acquired two spinning mills in Uttranchal and got into job work contract for two cooperative mills in Uttar Pradesh, both of which had been sick unit for years. Within a short span, Alps turned them into productive units while improving quality at the same time. In the year 2007- Alps started a state of the art spinning unit in Haridwar and during 2006-07 the turn over of the company reached 432.56 crores.

Today, Alps industry ltd. is one of India's leading eco-friendly textile product manufacturers and a principle interior infrastructure player. The company's enviable winning product portfolio includes an eclectic range of home furnishing, sophisticated fashion accessories and high quality yarn plus a complete line of architectural products that strive to bring lasting style beauty and the perfect finishing touch to any structure whether commercial or residential. Today, Alps' is a leading manufacturer of yarns, home furnishings, natural dyes and fashion accessories which are appreciated all across the globe. And now positioned as vertically integrated unit and has come a long way.

Alps offers a whole range of architectural products under the brand name VISTA

having the highest brand name LE-PASHMINA-in the Indian market with a wide distribution network.

Alps industry is one of the first on the textile industry in India to receive the ISO 14001 certification for environmental compliance. They are constantly working on improving the environment management system.

It is a modern, eco-friendly textile company with fully integrated, technologically advanced manufacturing facilities and diversified product range. It is serving to clients nationally and internationally. Company has facilities of yarn spinning decorative fabric weaving and processing capacities and fabrication facilities. The company has strengthen its product appeal to large overseas buyers by offering organic cotton based yarns and skin friendly and eco-friendly fabrics and home furnishing. R&D focus- the company is actively researching on the use of exotic fibers like milk-fibers, Ingeo (corn) and soya fibers.

Alps strength lies in their infrastructure as they have 7 production facilities, which operate on state-of the-art production technology and maintain Environment Management Systems.

Alps is committed for taking more and more steps towards making the organization a socially, economically, and environmentally responsible citizen of the corporate world.

ALPS AS ECO-FRIENDLY INDUSTRY:

Alps Industry is the only one that uses eco-friendly & skin friendly natural dyes for its home furnishing and fashion accessory products. After a comprehensive R&D of nearly a decade and a half, the company has standardized dye extraction technology and has developed application methodology of these natural dyes to textile products. Natural dyes also find applications in pharmaceuticals, personal care products and food. Alps have created environmental and sustainability challenges that are giving nightmares to scientists, governments, business and even individuals.

Steps taken by Alps to be Eco-friendly:

As an organization that finds nature as a source of inspiration, Alps have always attempted to keep their ingredients and processes as close to nature as possible.

1) NATURAL DYES: With a strong R&D and with the joint collaboration of Dept of Textile Technology of IIT, Delhi, Alps obtained natural recourses such as myrobian dried fruits, fenugreek seeds, pomegranate fruit rinds, katha, gallnuts, bark of acacia, roots of rubia along with many others. These are called as **N-COLOURS**-which are water extracted, purified natural dye powders. The use of N-Colours reduces the time and energy used by the dyers and ensures reasonable reproducibility.

2) ORGANIC COTTON: Alps procure organic cotton- cotton that's grown without pesticides from plants which are not genetically modified. Though organic cotton

has less environmental impact than conventional cotton, it costs more to produce. Side-effects of conventional production that are avoided in organic growing methods include:
- High levels of agrochemicals are used in the production of non-organic, conventional cotton. Cotton production uses more chemicals per unit area than any other crop and accounts in total for 16% of the world's pesticides.
- The chemicals used in the processing of cotton pollute the air and surface waters.
- Residual chemicals may irritate consumers' skin.

3) NATURALLY COLOURED COTTON: Alps procure naturally colored cotton-cotton that has been bred to grow on the plants to have colors other than yellowish off white color. Colors grown include red, green and several shades of brown. It doesn't have pesticides, chemicals, bleaches or artificial dyes. Yields are typically lower and the fiber is shorter and weaker but has a softer feel than the more commonly available "white" cotton. Since it doesn't have pesticides, chemicals, bleaches or artificial dyes, fewer allergies and respiratory problems are not found. This form of cotton also feels softer to the skin and has a pleasant smell. Naturally Colored Cotton is still relatively rare because it requires specialized harvest techniques and facilities, making it more expensive to harvest than white cotton.

4) USE OF HANDLOOMS: Alps industries still works with over 200 handlooms for sampling and executing small production orders. It is another way of minimizing environment pollution.

5) RECYCLING OF COTTON: Recycling process creates employment opportunity along with saving land, water and energy. The benefits are as follows:
-recycling saves energy.
-recycling saves environmental conditions and reduces pollution.
-recycling saves natural resources.
-recycling saves space for waste disposals.
ALPS' produces better quality of regenerated cotton which can develop yarn upto 20s count with 100% recycled material or after blending it with some virgin fibers. Further by segregating textile waste color wise, the dying process is reduced to a great extend.

ALPS AS "PROMOTER OF SUSTAINABLE FASHION":
Sustainable fashion is a part of the growing design philosophy and trend of sustainability, whose goal is to create a system which can be supported indefinitely in terms of environmentalism, economics, and social responsibility. Sustainable fashion or "ethical fashion" or "green fashion" is part of the larger trend of sustainable design where a product is created and produced with the consideration of its total life span and the impact that product on the planet; also know as a product's "carbon footprint".
Alps have introduced B-T cotton which has improved the quality and spin much finer cotton. They have reduced the average count by 25%, by which the fiber requirement has gone down by 30% for the same number of spindles. Similarly in

weaving Alps can engage more looms for weaving same sq. meter of fabrics. In dying and finishing Alps require much lesser dyes and chemicals along with water. This also benefits in less detergent requirements, water and power. The consumption of packing materials, transportation cost, storage cost is also minimized subsequently.

Some of the burning issues related to textile industry which can be considered as major impediments to achieving sustainable growth. They are:

Energy: On the one hand with the adoption of new technologies and automation, the demand of the power is increasing in manifolds thus hampering the industrial growth. The possibilities of generating own power is not at all economically viable. Clean power, quality of power, availability of power has always been a burning issue in the industry but no attention has been paid to the quality of power, which directly affects the quality of the product. Energy saving steps by Alps:

- Procurement of micro-hydel power generation plants.
- Replacement of all the lighting requirements of the offices and factories with energy efficient CFLs
- System of energy audit is being followed throughout.

Water: Every single drop of water is precious. Water saving is a fundamental issue. Alps promoting the concept of fiber dyeing in the textile industry to minimize the water requirement to the tune of 50-80%, in comparison to package dyeing and fabric dyeing, thus further improving the quality of the fabric production while at the same time making a humble contribution to the environment.

Waste Management: Due to increasing availability of a variety of products at affordable cost, the life of the product is reduced, thus causing more waste generation in all forms. Alps have started implementing this step by producing different types of products using different types of recycled waste generated from spinning, weaving and fabrication. Thus, they have not only utilized the waste, they have added further value to recycled waste. To solve the waste generation problem, the handloom weaver should be provided dyed cone yarns, which will improve loom production by 20-30%. This is based on the experience of running handloom in Alps Industries.

Oil and Land: India being one the highest populated countries in the World, demand and supply go side by side. Due to the increasing population, the availability of agricultural land is definitely going to be affected. Now the farmer will become selective in growing only those crops that will improve his economics. Today, with oil being one of the major scarcities for industrial growth and development, growing cotton may not be the choice of the farmer, which will affect the availability of cotton, thus affecting the spinning of yarns. The impact of increase in oil price may not be as high, however, as that of increase in cotton price which will have a direct impact on Sustainable growth and production. The only potion left is to the increase cotton yield and Alps is taking appropriate steps towards this.

Ginning: The work practice of ginning is man generated, which is causing lot of

contamination in Indian cotton. Due to this reason, the industry is ready to pay Rs. 5-10/- per kg extra to buy American or Australian cotton. The spinner has to bear the load by using costly equipment to make the cotton contamination-free, thus increasing the cost of the yarn produced. In spite of taking all appropriate measures during the spinning process, Alps is still not able to satisfy the demand of the customers thus not being able to fetch better price globally.

Labour laws and training: The Textile Industry is the 2nd highest provided of employment after the agriculture industry. Today due to impractical labours laws, Industrialists prefer to buy expensive machines, which requires less manpower as compared to lesser automated machines and requiring more workers but both type of machines can produce equally good quality of yarn. So, while sanctioning the technologies, the funding agencies should also keep in mind that they should encourage those projects that are more employment friendly.

CERTIFICATION:

GOTS: ALPS industries have **received certification** from control union; a designated agency for Global Organic Textile Standards (GOTS).The certification confirms their ability to manufacture yarns from organic cotton in conditions protected from contamination from ordinary cotton. This certificate places Alps on an internationally accepted platform.

ORGANIC EXCHANGE CERTIFICATE: This certificate has given Alps the license to mix organic cotton with inorganic cotton according to the end use and the buyer's requirement.

ISO 14001: 2004: Alps' is the first company to receive EN ISO 14001: 2004 for implementing and maintaining an "Environmental Management System".

EXPANSION PLANS FOR NEAR FUTURE:

- Development in the areas of decorative weaving and processing and high quality compact yarn. The yarn capacity would stand at 54, 600 tons/ year and weaving capacity at 27.4 mn sq.mtrs/ year.

- Expansion in weave sector helping them to tap the high end quality conscious market. Compact yarns have characterizes of low hairiness there by giving better luster to the fabric woven from this type of yarn.

- The expansion in weaving segment is mainly to enhance their decorative fabric range.

- Alps' is planning to manufacture seat covers for automobiles in collaboration with a Korean company.

Plenary Session 3

"Sustainable Production Processes, Technologies & Ethical Issues"

PROFILES OF THE SPEAKERS

Plenary Session 3 : *"Sustainable Production Processes, Technologies & Ethical Issues*

LAKSHMI MENON BHATIA
Director,
Global Partnerships,
Social Responsibility
GAP Inc.

The young vibrant Indian social activist who has been at the helm of Gap Inc's 'Social Responsibility' agenda for over a decade now is heading Gap Inc's team developing its Stakeholder Engagement Strategy. She is one of the oldest members of a 80+ member Social Responsibility team that has been instrumental in transforming Gap Inc.'s image from being the poster child of the Anti sweat shop movement to have been rated by as one of the leading Brand in Social Responsibility & Stakeholder engagement. Lakshmi's efforts at a Global Level (with International NGO's, Unions, ILO, World Bank-IFC etc.) has resulted in formulation of a number of highly successful partnerships including with the Global Union Federation for the Apparel Industry on Freedom of Association/ Collective Bargaining issues in the Gap Inc. Supply chain.

She has been involved in a number of successful negotiations in Supplier factories for Gap Inc. as well as for other Brands as a Board member of the Ethical Trading Initiative in the UK. She has driven Brand Collaboration on common issues in the Supply chain resulting in the setting up of various Brands/ Retailers Working groups in a number of countries including India.

Serving on the Ethical Trading Initiative's (UK) Board of Directors since 2004, she is one of Gap Inc's key representatives at various multi stakeholder groupings in Asia & Europe and chairs the Purchasing Practices Working Group at ETI which looks at the impact of Brands & Retailers own Sourcing practices and its impact on workers in the Supply Chain.

She is currently the point person in India for Gap Inc. to help develop a sustainable strategy in conjunction with other stakeholder groups including the Government, UN organizations, other Brands / Retailers , NGO's & Trade unions to address the complex issue of 'Child Labor' and Human Trafficking in the Garment Supply Chain.

Her initiatives between 2003-2006 were recognized with her being elevated to the position of a Director, leading a global team. During 2000-2003 as the External Relations Officer (India), Lakshmi helped set up and monitored the India chapter of 'The Global Alliance for Workers and Communities' - a joint initiative between Gap Inc., Nike, IYF (International Youth Foundation based in Baltimore), the World Bank and some American Universities where Gap Inc. committed a funding of 5 million USD. Her job responsibilities included project planning, identifying local resources in India, interfacing with local NGO's in the field of health, micro finance and life skills.

She helped set up the initial Needs Assessment study and worked with local groups on the research design, design of research instruments, content analysis, report writing, strategy formulation etc.

Lakshmi was hired as one of the first Vendor Compliance Officers for Gap Inc. globally in 1997 and prior to that she spent over 7 years with several NGOs and social welfare organizations in India working on issues of migrant workers, slum dwellers and street children.

Lakshmi has addressed various internationals fora worldwide as Gap Inc's spokesperson and is widely quoted in leading international media.

PROFESSOR (DR) M L GULRAJANI
is emeritus chair professor at the Indian Institute of Technology, New Delhi

His main research activities involve textile chemical processing, dyeing and printing. Prof. Gulrajani has undertaken more than 50 consultancy projects from various textile industries and guided more than 100 students for Ph D, M Tech and M.Sc. degree, published over 150 research papers, edited 24 books, and has five Indian patents. His three joint-patents on the Production and Application of Natural Dyes have been put to commercial use by Alps Industries, Ghaziabad. He has worked as R&D Executive of East Indian Cotton Mills), R&D Director of Alps Industries and World Bank Consultant on Silk Development Project in Bangladesh. He is on the Editorial Board of the Society of Dyers & Colorists (UK), The Journal of Fibre Society of Japan, Dyes Journal of China, and fellow of the Society of Dyers and Colorists (UK). He is a member of the Board of Directors of Alps Industries Limited, J.J. Exporters, Kolkata, Info-Tech Limited, and Gujrat Eco-Textile Park Ltd., Surat. Prof. Gulrajani is a recipient of more than 10 awards for his original contribution and technology development from various agencies, viz. Hari Om Ashram, Century Mills, and Indian Merchant's Chambers

PROF. XIAOMING TAO

Chair Professor in Textile Technology HeadInstitute of Textiles and Clothing The Hong Kong Polytechnic University

Prof. Tao is the World President of the Textile Institute, an international professional association for textiles, apparel and footwear industries with membership covering over 90 counties. She is elected Fellow of American Society of Mechanical Engineering, Royal Society of Arts and Hong Kong Institute of Textiles and Apparel, and serves on editorial boards of nine international journals.

Prof. Tao is currently the Chair Professor in Textile Technology and Head of Institute of Textiles and Clothing, The Hong Kong Polytechnic University. Prof. Tao's research has been covered nano technology, photonic fibres and fabrics, electric fabrics, yarn spinning and textile composites. She has won numerous scholarships and prizes from USA, Australia, New Zealand, UK, Hong Kong and China.

YATHINDRA LAKKANNA

Design for human energy L, Associate Professor National Institute of Fashion Technology, Bangalore

Education :2008 - Doctor of Philosophy (Product Design) from Dr MGR University (Thesis Submitted)

2002 - Master of Science (Systems Engineering) from Birla Institute of Technology & Science, Deemed University, securing 7.66 CGPA on 10 Scale
1997- Bachelor of Engineering (Mechanical Engineering) from Bangalore University, Bangalore Institute of Technology, securing First Class with Distinction

PROFESSIONAL EXPERIENCE:

Since 2001	Associate professor & Retail Design Consultant	National Institute of Fashion Technology Ministry of Textiles, Government of India
1999 - 2001	Lecturer	R.V.College of Engineering, Bangalore
1997 - 1999	Engineer (Product Design)	Eshwari Industries, Bangalore

RESEARCH INTERESTS:

- Product Design
- Design for Manufacturing
- Sustainable Design practices

PUBLICATIONS IN REFEREED JOURNALS AND BOOKS:

1. Yathindra Lakkanna, "Design for Variety: An Extreme Design Elements Value Model of Concept Selection", *at Team Tech International Conference held at IISc Bangalore during Feb 2006*
2. Yathindra Lakkanna, "Design For Variety - A Methodology for Incorporating Voice of Customer in Product design and Quantification of Design Elements" *at Agile Manufacturing: Traditional, Group Technology, Cellular, Lean, JIT, World Class, TQM, CIM, CAM, FMS, Agile, etc section of Agility, Design And Manufacture International Summit & Expo 2005, 10th - 13th December, 2005, Centre for Agile Manufacturing Research and Development, Department of Mechanical Engineering, University Visvesvaraya College of Engineering, Bangalore University, Bangalore*
3. Yathindra Lakkanna, "Lean Manufacturing: Technology Based Total Solutions for Manufacturing Optimization", *at World Class Manufacturing 19th National Convention of Production Engineers 2004: [81-98], jointly by Institution of Engineers (India) & BEML, Mysore*
4. Yathindra Lakkanna, "DFM Techniques in Bidri craft" *at Team Tech an International Conference of Manufacturing Engineers organized at Indian Institute of Science, Bangalore*

OTHER PUBLICATIONS:

1. Yathindra Lakkanna, "Mission, Vision, opportunities and challenges of Higher education in India", *a national seminar organized by Center for Education Beyond Curriculum, Bangalore*

PROFESSIONAL AFFILIATIONS:

1. Life Member Material Research Society of India
2. Life Member National Design research Forum
3. Associate Member Institution of Engineers (India)
4. Life Member-Fluid Power Society of India
5. Life member Administrative Staff college of India (Hyderabad)
6. Life member Indian Institute of Production Engineers
7. Life Member Indian Red Cross Society (Social representation)

Sustainable Chemical Processing of Textiles

M.L. Gulrajani
Emeritus Chair Professor Indian Institute of Technology, Delhi

Abstract

Chemical processing of textiles is a polluting, energy consuming process that contributes to greenhouse gases and leaves its footprint on the processed products. To achieve sustainable textile production, easily biodegradable, nontoxic chemicals, dyes and finishes be applied at ambient temperature consuming minimum quantities of water and energy so as to have very low carbon foot print. Such processes are not always possible therefore one can aim towards achieving the desired finished product with minimum emissions and solid waste.

Various assessment and evaluation standards have been evolved to certify the sustainability of fibres, chemicals, dyes, emissions, effluents and processes that go into the production of a textile product. A sustainable textile process is hence a process that meets or exceeds the environmental, social, and economic performance requirements set forth in a prescribed Standard.

New chemicals, dyes and finishes produced from renewable resources and have low carbon debt that can be applied at low temperature are being researched, produced and increasingly introduced in the chemical processing of textiles. This paradigm shift in the processing of textiles has been promoting the use of enzymes, natural dyes, bioactive polymers and other such health-promoting functional finishes. Minimum application techniques such as ink-jet printing and finishing along with the use of nanotechnology are other such initiatives leading to relatively more sustainable chemical processing of textiles.

One can reduce the carbon foot print of a given product by selectively using such sustainable technologies. However, an integrated process that is almost entirely carried out with sustainable chemicals, dyes finishes and application techniques in a sustainable 'green' building along with the use of renewable energy source and a system to recycle the water is required to be developed and implemented.

Nu-Torque™ Singles Ring Spun Yarns : Structure, Properties and Applications

Prof. XM Tao
Institute of Textiles and Clothing, The Hong Kong Polytechnic University

This paper presents Nu-Torque™ ring yarn technology, an energy saving and environmental friendly spinning technology for solving the problems of singles yarn snarl and fabric spirality. The technology was invented and developed in The Hong Kong Polytechnic University, and has been adopted by industry for producing commercial textile and apparel products. This paper will concentrate on the structures and properties of Nu-Torque™ knitting and weaving yarns which are made from carded, combed cotton as well as combed wool. The performance of the yarns will be discussed in various sub-sequential processing stages from winding, fabric manufacturing, dyeing and finishing as well as garment making. The performance of knitted, woven as well as garments will be evaluated with those made from the relevant conventional ring spun yarns.

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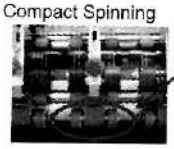
- **Recent developments in ring spinning**
  - Compact spinning
    - Low yarn hairiness
    - High yarn strength
  - Solospun
    - High yarn abrasion resistance

Compact Spinning



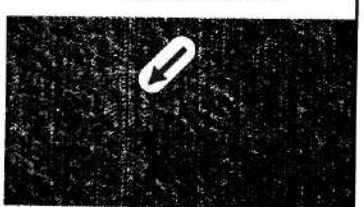
Additional components on the drafting system

Solospun

Though some yarn properties are improved by the Compact spinning & Solospun, both methods can not reduce the **yarn residual torque** and solve the resulted problems on fabrics, such as the spirality of knit fabric.

Residual Torque - Unsolved Quality Problem

Garment distortion



"small snake" pattern on woven fabric

Exiting Methods to Reduce Yarn Residual Torque

Setting of yarn

- Heat setting
- Steaming
- Chemical treatments

Disadvantages

- High energy cost
- Yarn damage
- Chemical discharge

Physical balancing

- Plying two identical single yarns with opposite twist direction
- Knitting two single yarns with the same twist but in the opposite direction

Disadvantages

- Additional cost on doubling
- Fabric weight limited by the minimum count of the plied yarn

Physical Balancing Methods:

1992 Sawhey suggested a system to produce a cotton covering and polyester core yarn

1995 Sawhney & Kimmel proposed a series spinning system for processing torque balanced yarns

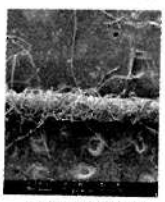
1997 Tao proposed a de-twisting method for torque balanced yarns by friction, rotor and air-jet spinning

Disadvantages

- Two separate machines and processes (**high cost**)
- **Not applicable** to the ring spun yarns

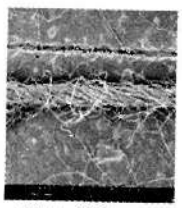
Surface Structure of Nu-Torque Yarns

- compact structure
- exist of wrapping fibers



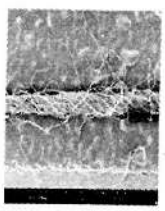
20Ne,440tpm

(a) Nu-Torque™ singles yarn



20Ne,440tpm

(b) Low twist conventional yarn



20Ne, 634tpm

(c) Normal twist conventional yarn

Nu-torque™ Yarn: internal structure:

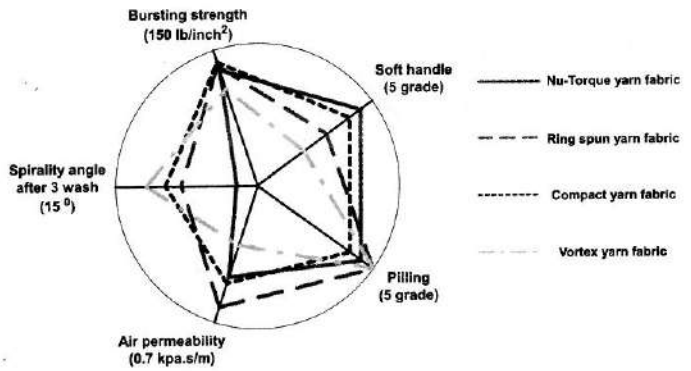
(a) Nu-torque™ singles yarn (440tpm)

(b) Low twist conventional yarn(440tpm)

(c) Normal twist conventional yarn(634tpm)

- lower fiber helical angle
- large magnitude and frequency of fiber migration
- exist of fiber segments twisted in the opposite direction of the yarn twist

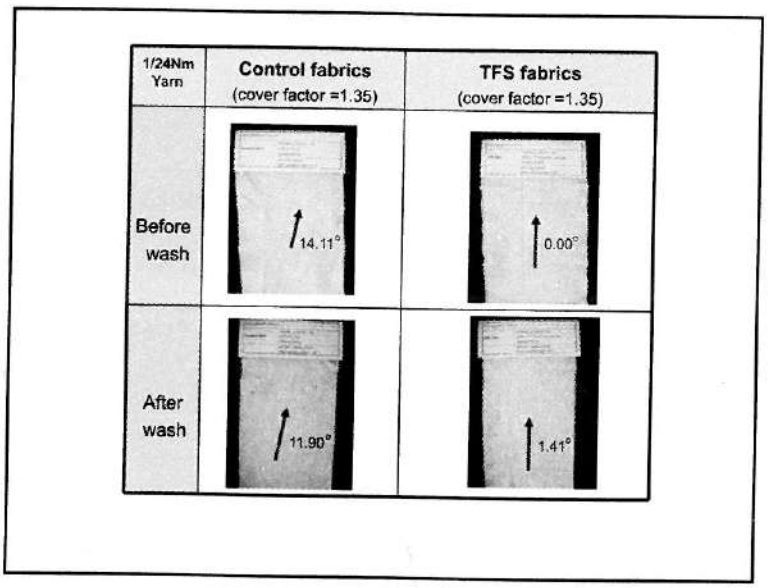
Comparison of Knitted Fabrics

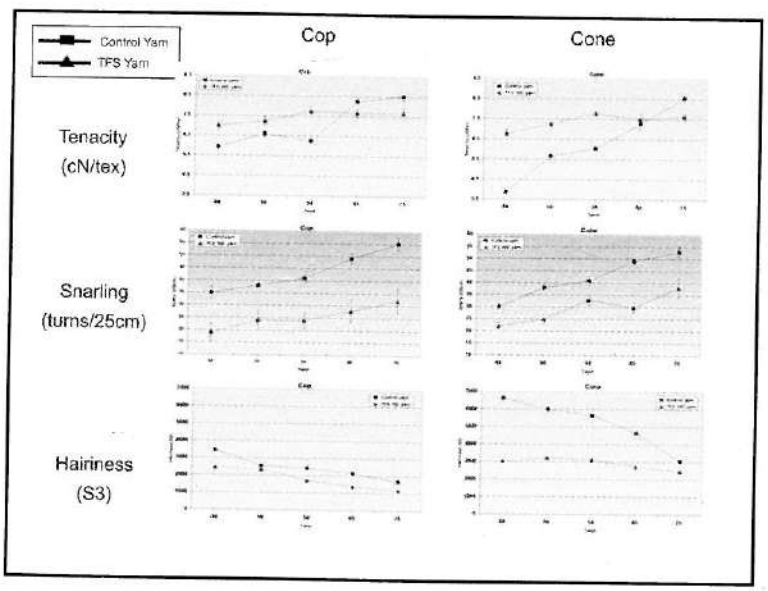


1/36Nm Wool Yarns/Fabrics

- for cut and sewn fabrics

Yarn twist factor	*Yarn Results*					*Fabric Results* (cover factor=1.35)	
	Mean Tenacity (cN/tex) [CV%]	Min Tenacity	Mean Elongation (%) [CV%]	Mean No. of Snarls [CV%]	Hairiness (63)	Average angle of spirality Θ Before Washing [CV%]	Average angle of spirality Θ After 1st Cycle [CV%]
1/36Nm Control Yarn							
α 75	7.57 [11.7]	4.47	23.95 [22.5]	66 [5.6]	1853	20.61 [0.2]	**16.35** [4.6]
1/36Nm TFS Yarn							
α 42	6.57 [10.2]	4.74	10.37 [31.9]	16 [20.2]	1103	0.00 [--]	**2.83** [32.2]


1/24Nm Yarn
Control fabrics
(cover factor =1.35)
TFS fabrics
(cover factor =1.35)
Before wash
After wash
14.11°
0.00°
11.90°
1.41°


Control Yarn
TFS Yarn
Cop
Cone
Tenacity
(cN/tex)
Snarling
(turns/25cm)
Hairiness
(S3)

Unique product features that cannot be achieved by the existing spinning methods:

- very low yarn residual torque
- very low yarn twist but high yarn strength
- very low spirality angles of knitted fabrics and sweaters
- cashmere-like soft handle

Good product features that are comparable to the existing prevailing spinning methods:

- less yarn hairiness
- good air permeability
- good fabric pilling resistance

Nu-Torque Technology in Mass Production

- Materials cost: reduced by **30%** for 2/80Ne with 40Ne
- Spinning productivity: **44%** increase compared to conventional yarn, **17%** to compact yarn, **100%** to plied yarn
- Yarn end breakage rate per thousand spindle hours: **<10**
- No doubling and twisting with saving of **HK$1.4 per lb** yarn
- Energy saving: **48000KWH/day for 10000 spindles**
- **No chemical and no water/steam**
- Cost saving in garment making: **5%** of cutting wastage and cost saving in finishing
- Relatively **low machine investment and operation cost**

Sustainable manufacturing processes

Yathindra Lakkarına
Design for human energy L, Associate Professor National Institute of Fashion Technology, Bangalore

Keywords :Sustainable development Human energy Sustainable design methodology, Sisal fiber production Craft development

Design for Human Energy

The increasing consciousness about sustainable development globally has affected every aspect of human life, which requires us to rethink the way we produce/manufacture things. That has inspired many environmentalists and researchers to develop theories and results, which helps in sustainable /green manufacturing.
Sustainable/Green manufacturing always focuses on to certain theories to be followed like, increase the use of local resources, reduce the use of artificial energy, increase use of manpower in other words, use recyclable materials (preferably from local resources), reduce use of toxic materials, etc. in other words effective application of human energy.

Manufacturing is directly related with the design process. The Traditional sustainable manufacturing techniques from our heritage knowledge database in form of effective adaptation of zero artificial energy or in other words effective adaptation of human energy based manufacturing techniques. Designing an environmentally sound life cycle rather than designing product. It helps analyze product and its usage at every stage of its life cycle, which becomes a resource for designers for developing sustainable/green design methods.

This is explained through a case study on Sisal fiber and product range (Accessories)

Keywords Sustainable development, Human energy, Sustainable design methodology INTRODUCTION
About why should we look into the area of manufacturing processes to make them more sustainable?
Why bother going green as an individual when you know there are lot of factories burning enormous amount of energy and fossil fuel every minute, which equals the amount of CO2 generated anyhow. And where do the CO2 come from, natural resources like mountains, forests, sea, etc.

It's all about the products we use and spend energy on things we need or desire.

Increasing demands and consumption of products of daily needs have boosted the production of these products, in which production takes a major amount of energy, 90% produced by burning the fossil fuels. It may be electricity to run the production machines or gasoline to import and export raw material/final product. Now there is a point here which can make difference for every individual to take a look at their daily needs, because if the consumption rate increases, it will automatically increase the production ratio by some percentages, which means more energy will be spent and more fossil fuels will be burnt. In major cases the product development cycle is a linear system, at the end of it the product is either left for land fill or recycling which is another process costing energy.
Now for an individual the following questions would be of interest to make the most of the products bought.

- What do they buy?
- Where do they buy from?
- Where does it come from?
- What is it made of?
- Why do they need that product?
- Where does the product go at the end of its life cycle?

Increasing demand/consumption is resulting into reducing resources, decreasing prices (making people use the product carelessly because it is cheap, use and throw products), global climate change, etc.

The total dependence on fossil fuel or fossil fuel generated energies has endangered the human existence on Earth. The examples do not stand a chance as compared to the future disasters which will cause by climate change and global warming. The nature has already started reacting towards the blind act of human kind. The increasing population and pollution has affected very negatively to the environment, society and human culture.
The increasing use of fossil fuel based technology has nearly emptied the natural resources, endangering the environment as well as the human existence itself and also other species on the earth, the species which are also a big source of our day to day needs and desires.

Natural resources of fossil fuel have started to collapse cause of regular and big amount used by each one of us, now it has become a threat to human economy that what would happen if we run out fossil fuels. Many scientists and engineers are looking forward to find another source of energy or implement renewable energies like wind mills, solar energies, etc. and looking forward to implement ideas to generate more renewable energy.
The concept of using the fossil fuel to generated energies have been implemented to make human life more easy, fast and comfortable, reducing the amount of daily human energy spend to work. As we discuss the human energies used to spent every day was different than today. The traditional ways where less of technology and more human energy/animal energy was included to get the

daily work done, whether it was agricultural needs, transportation or food (like milk products, vegetables, etc).
Design for human energy - Case study of Sisal fiber based products and the manufacturing processes inspiring nearly 0% energy requirements.

The following case study of sisal fiber products provides an important insight in to the production process of handicraft products and also inspires to implement the same in our industrial processes.

The project was a training based workshop for artisans, teaching and making them aware new techniques can be used to make better finished products according to the trend and market requirements.
Objective: Promote Sustainable and equitable agriculture and rural prosperity through effective credit support related service, institutional development and other innovative initiatives. In support with NABARD (National Bank for Agriculture and rural development) and RNFS (Rural non form development) and developing products of organic fashion and accessories

As other villages and mostly all Indian villages' agriculture is the main source for income and survival for Kuderu, Karnataka. No plantation of sisal is done in this area. It is found in and around the Chamrajnagar district. About 275 species are distributed in tropical regions. The Portuguese introduced agave in India in 15th century. They are now completely neutralized throughout the country.

Apart from ropes, twines and general cordage sisal is used in low-cost and specialty paper, dartboards, buffing cloth, filters, geo-textiles, mattresses, carpet, handicrafts, wire rope cores.

Visual properties

- Large genus of short stemmed
- Wooden plants bearing rosette of long
- Erect
- Pointed
- Fleshy leaves with fibers and flesh
- Small greenish gray hedge plant

Physical properties

- The leaf has a thorn at the tip and grows up to a height of two to three feet
- These leaves yield valuable fiber
- Strongest and hardest fiber and is preferred for high traffic area both in residential and commercial application.

Growing conditions

Mainly this plant is found abundance areas like fences, near compound walls, wild areas.

- Found in dry area
- Less water content required

No artificial resources like urea, etc.

Extraction of fiber

Manual crushing by hand and other tools
End products are Sisal fiber
Crushed flesh (later used as fertilizers, natural manure
Process used is completely Eco-friendly and also economical
Manual process by hand (use of human energy)
Man power: Tribal of Chamrajnagar Dist.

Production process for making products from sisal fibers

Material and ingredients

Sisal fiber
Vegetable dyes
Basic vessels for dying and other cleaning process
Twisting tools

Rope making

It is one of the most basic skills for converting any linear material into a useable stage. Ropes can be made by two methods.

Hand-spinning
Machine spinning

Sisal is soaked in water and the same wet fiber is rolled with hand or machine. The material is twisted only in one direction thus obtaining an S twist or a Z twist. Machine spinning is a techniques used by the locals to increase the production rate of ropes.

Two metal hooks are fixed on the cycle wheel and a handle on the opposite side of the wheel for rotating the wheel.

One person rotates the wheel while one or more person makes rope by adding the fiber to the continued rope.

Braiding

Another technique/style for making the rope, mainly plait type is used.

Dyeing

Dyeing is an essential part of sisal craft.

For 1 Kg of sisal fiber raw material

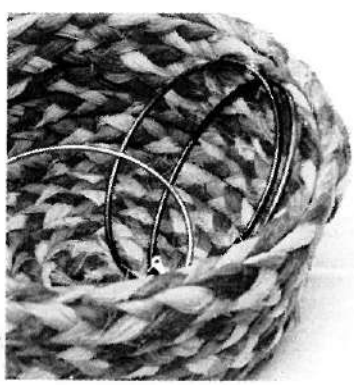
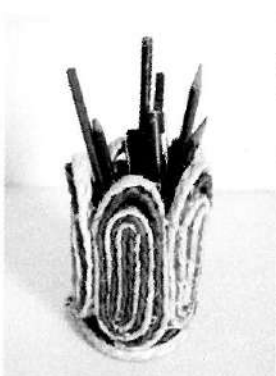
Ingredients:

Basic dyes and water
Tools and equipment:
Vessel of 30 Liters capacity
Firewood
Stirrer

Procedure:
25 liters of water is being boiled and the desired color is mixed in a small steel container, than poured in the boiling water and mixed well called dye bath. After the dye bath is ready raw sisal fiber is added to the bath and again boiled for 25 to 30 minutes and taken out to dry under a shade.
After drying it is ready to use as a base material for ropes or any other products.

Activities at the work shop
20 artisans from different villages (Tenkenmole and Barkanmole) were selected for the design development workshop. Participated artisans were shown interest in learning new products and new skills. Most of the crafts people were experienced in making braids and ropes with sisal fiber.
· The skills used in the workshop were braiding rope making, basic carpentry and stitching.
· New skills of constructing table top and small products as reinforcing the braid with metal wire to add strength.
· New colors were introduced and products made.
· Color combination and bringing out of entirely new products made of sisal fiber were very important aspects of the workshop.

Benefits of the workshop
- The techniques and skills introduced in the workshop are easy to adopt and ensure fast production.
- The product range developed in the workshop are according to current market trend and demands, thus ensure a wider market
- New products developed during the course of workshop will cater to a larger market segment, as these products are cost effective.
- The design development workshop conducted by the NABARD and IDPMS has given a new insight to the artisans.


Conclusion
The material: Sisal fiber as raw material for products

Totally biodegradable material availed from natural resources without any artificial

energies or toxic resources like urea. As far the sustainability of the product is concerned the end products are remaining with the same properties till their life time, at the end of their life cycle they can be recycled or reused to create another set of products.
Sisal fiber as a raw material has already been used by the automobile industry for replacing the FRP and also competing with polypropylene to be used as raw material for many binding activities in Industrial sector, helping to reduce the toxic materials used in the process of making products.

Sustainability of the manufacturing process

the manufacturing from the beginning of getting the raw materials has the characteristics of being a green product as it is directly from the leaves.
The handcrafted products made from local resources available and with local human energy is a very good example of sustainable manufacturing process as everything is counted. Almost 0% of fossil energies used for production except the burning of fore wood to boil the water for dyeing, which can be replaced with a renewable energy source for 0% energy consumption and 0% waste of material.
Promoting the craft sector and giving business to artisans and also inspiring them to know and implement new techniques for better finished products through conduction this kind of workshops.

Another way of looking at the whole process

The combination of the raw material and human energy based production could be an inspiration for the industrial processes to look into the processes again and can be redesigned to engage more human energy, to use local resources and provide employment to more people for a better economy.

Future possibilities
Raw material - Biodegradable material produced without major investment
Production process - Human energy to manufacture
Design - designers inspired to design sustainable products

The combination of all three can have a good impact on carbon emission and saves other resources if implemented to replace other existing products made from polymers with high amount of fossil fuels and toxic materials.

Sisal fiber products are Eco-friendly and have a longer life as a natural raw material and have very strong physical properties to resist any kind of weather conditions.

The next level of the process which is transporting the products can also be looked into for better and sustainable results.

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Greenpeace.com Information on awareness about things happening around the world

Sustainable design journals by CFSD Center for Sustainable design, UK journals 1 to 10 available online.

Documentaries

National geographic Six degrees can change the world, Explaining about how the world will change if the temperature rise by just 6 degrees because of the energy consumption 2008

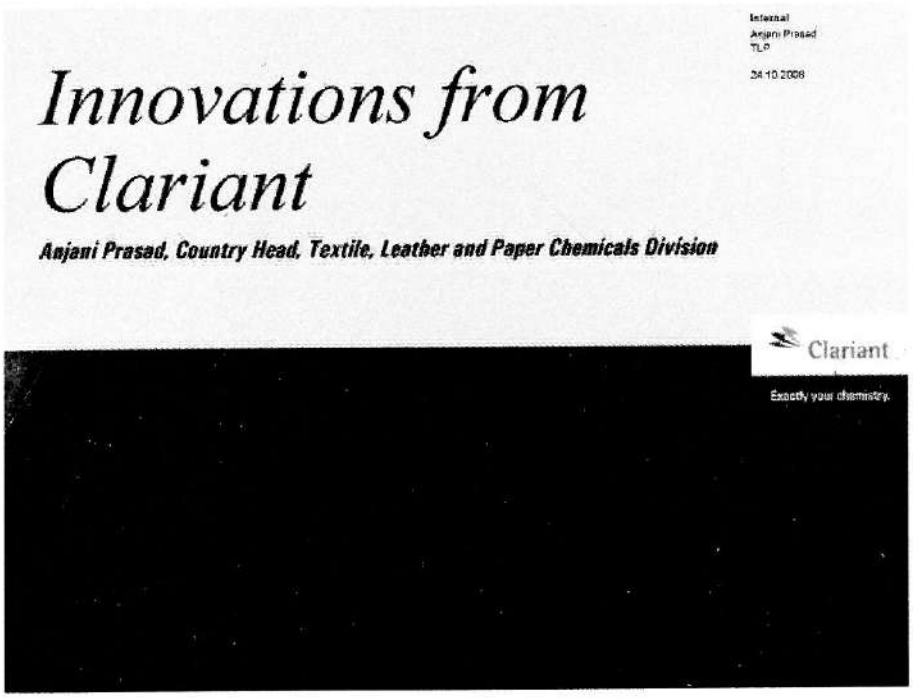
The 11th hour A documentary compiled relating climate change and enormous use of energy resource for our daily needs 2007

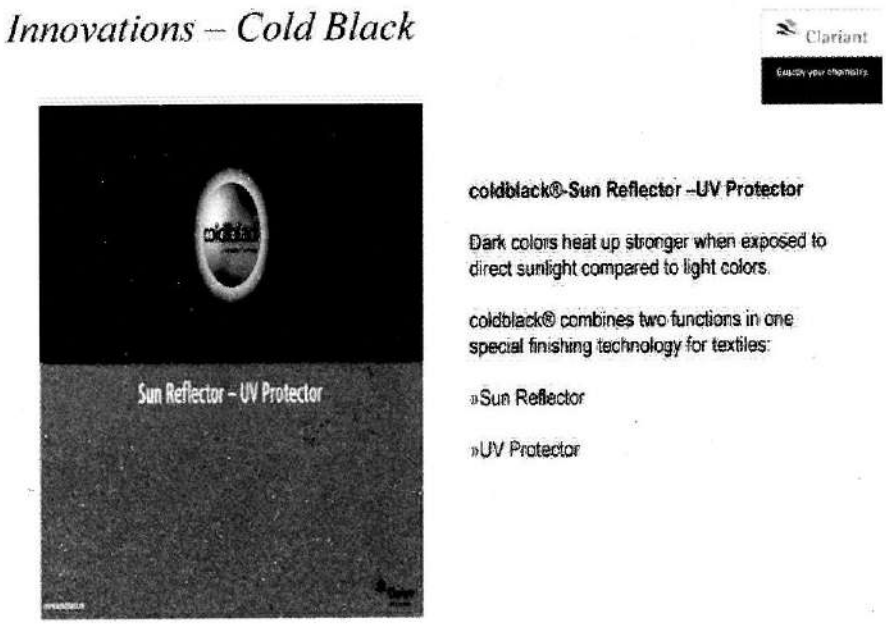
King corn The incredible use of energy in production of fast food products 2007

The corporation Current scenario of the industry ruled by the corporation, even the government 2003

Nu-Torque™ Singles Ring Spun Yarns : Structure, Properties and Applications

Anjani Prasad





Product Overview for Denim

bluesign®
approved

Sustainability in textiles requires effective processes, and products that are engineered and proven to perform.

Clariant's Sulphur-System range will contain products covering all processes that already are, or shortly will be registered or grey by bluesign®.

Innovations from Clariant, Anjan Prasad, TLP 24.10.2008 Slide 6

Clariant

coldblack®-advantages

- Optimal protection from heating up due to sunlight

- Textiles stay cool to the touch

- Reliable protection from UV rays (minimum UPF 30+)

Innovations from Clariant, Anjan Prasad, TLP 24.10.2008 Slide 3

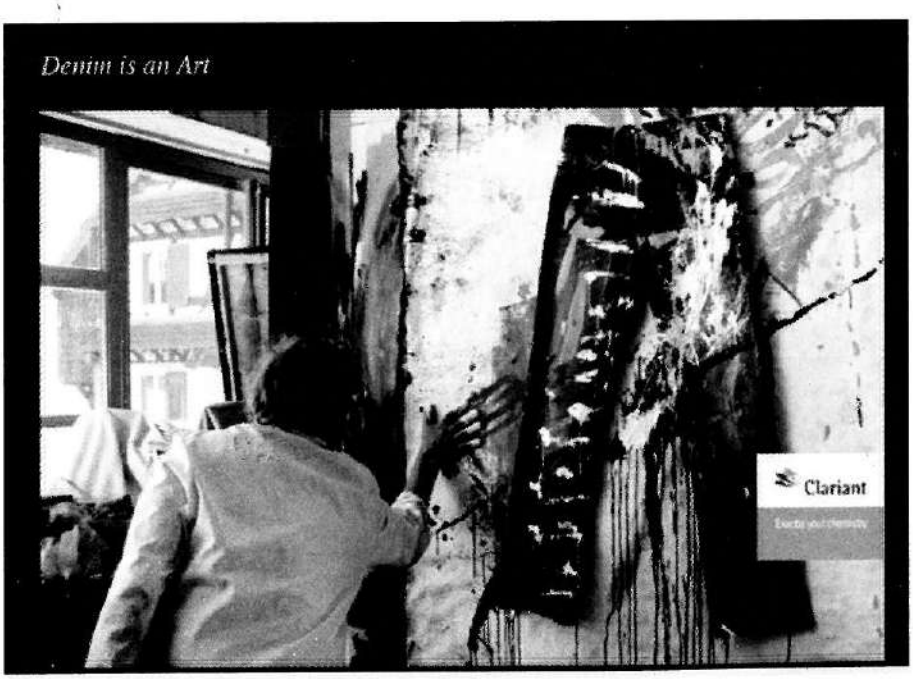
"bluesign® approved" Components

Clariant

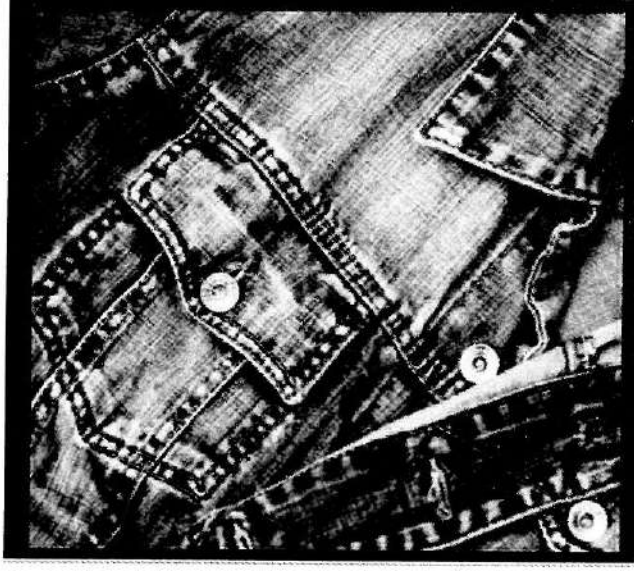
Exactly your chemistry

The coldblack® finishing only contains "bluesign approved" components. "bluesign approved" components are as low as possible in harmful substances, making them benign to mankind and the environment and encouraging the economical and ecological use of resources in the production process.

bluesign®



Clariant's Denim Sulphur System



Diresul RDT's take the design options of indigo-dyed fabrics offer further – but INDIGO-free!

Sustainability that does not sacrifice Design variability: Diresul RDT's offer multiple design options that also allow for minimum resource-consuming production routines (Clariant's Pad-Dry!

Quality: high fixation rates of colours plus good fastness levels of the final garment allow effective utilisation of dyestuff

For the whole denim process we have engineered all our individual products to perform at its best in combination with each other

Diresul RDT's are proven to be 100% Biodegradable and are GOTS approved.

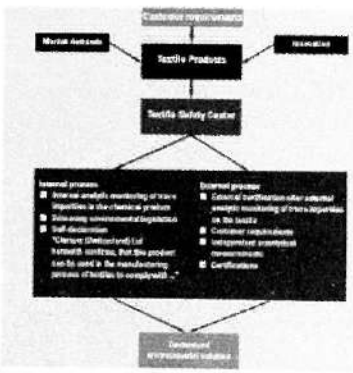
Innovations from Clariant, Anjani Prasad, TLP 24.10.2008 Slide 7

4 *Compliance & Product Safety with ecological focus*

Clariant

Exactly your chemistry

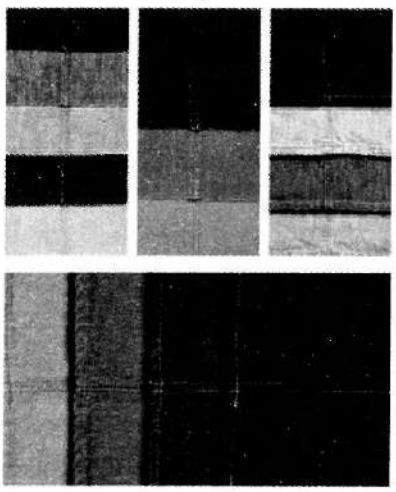
Overview on Clariant's Textile product safety procedure



Innovations from Clariant, Anjani Prasad, TLP 24.10.2008 Slide 10

Denim

Clariant's Sulphur Dyes



Advanced Denim

Innovations from Clariant, Aryan Prasad, TLP 24.10.2008 Slide 8

4 E's

Intelligent chemistry

Clariant

Sustainability and environmental issues are becoming more and more important for consumers, retailers, dyers, finishers and producers of textiles along the whole value chain. The compliance of dyes and chemicals with all kinds of various textile standards (like GOTS, Oeko-tex, bluesign) is already a must. And saving resources like water, wastewater, energy, time or efficiency in general links ecology and economy. Various processes and applications are described, how by using intelligent chemistry we can bring these 4 E's – environment, efficiency, ecology and economy – together. Even the textile consumer profits from intelligent effect chemistry in home laundering, saving natural resources through less frequent washing or lower washing temperatures ..."

Innovations from Clariant, Aryan Prasad, TLP 24.10.2008 Slide 9

4

International textile standards

Clariant

Exactly your chemistry

Restricted Substance Lists (RSL)

- Customized environmental standards of retailer and brands
- Requiring the absence or limiting the concentration of certain chemical substances in the product or on the finished textiles
- RSL defined and updated by the retailer and brands often linked with the company's corporate social responsibility programs

Clariant supports restricted substance lists. Clariant products comply with established standards of major brands and retailers (e.g. Marks & Spencer).

Please see our updated compliance list on www.textiles.clariant.com

Oeko-tex Standard 100

- Tests for harmful substances according to the Oeko-tex standard 100 for textile products
- Globally uniform testing and certification system for textiles (yarn, fibers, fabrics)
- Scientifically founded evaluation standard for the human ecological safety of textiles
- Oeko-tex label informs end users about tested safety for skin-friendly clothing and other textiles

Most Clariant products comply with the requirements of this well-known standard.

www.Oeko-tex.com

Innovations from Clariant, Anjani Prasad, TLP

4

International textile standards

Clariant

Exactly your chemistry

control IMO

Global Organic Textile Standard (GOTS)

- Defines the necessary requirements to ensure the organic status of textiles
  - harvesting of the raw materials
  - environmentally and socially responsible manufacturing
  - labeling
- Standard for organic textiles covers:
  - production
  - processing
  - manufacturing
  - packaging
  - labeling
  - exportation
  - exportation
  - distribution

of all natural fibers

Clariant offers a broad range of dyes and textile chemicals according to the GOTS standard.
These products are certified by the independent Institute of Market Ecology (IMO) in Switzerland.
www.global-standard.org

bluesign® Standard

- The bluesign standard covers the complete range of environmental, health and safety issues throughout the textile production chain
- The bluesign standard certifies:
  - substances that have been rigorously tested against harmful effects on humans and the environment
  - for efficient consumption of relevant resources
- Most efficient and safe use of resources, i.e. air, water, health from fiber production to retail, from consumer to the disposal of the garment

Clariant supports the bluesign standard and classifies its products in the bluesign's blue & grey categories.
www.bluesign-tech.com

Innovations from Clariant, Anjani Prasad, TLP

4 Polo Shirt

Pretreatment

Optical brightening

Hostalux®
Leucophor®

- highest degree of whiteness
- extremely brilliant
- neutral – reddish – bluish shade
- very good light- and chlorine-wash fastness
- no yellowing during storage
- high acid stability

Ecology*
- GOTS approved (only for BSA)
- Oeko-tex approved
- bluesign approved

Economy
- combined application possible
- easy to mix with other OBA

Efficiency
- high active OBA
- high quality products
- highest degree of whiteness

Environment
- biodegradability
- less effluent load
- CO_2 saving

* For detailed product information see textile website www.textiles.clariant.com

4 Chemistry & Alternatives with ecological focus

Diresul "Indi" dyes

Diresul IndiBlack RDT-2R liq

and/or

Diresul Indinavy RDT-G liq

Diresul Indiblue RDT-R liq

Diresul Indiblue RDT-G liq

Subsequent Eco-Bleach wash-down
For bright bleached effects & AOX free garments

Diresul IndiBlack RDT-2R liq
for a dark reddish grey

4 Denim

Dyeing & Printing

Standard denim processes with sulphur dyestuffs

Black Denim

- **Non mercerized/rope dyeing:** Dyeing-Washing-Oxidation-Washing
- **Mercerized/slasher dyeing:** Mercerising-Washing-Dyeing-Washing-Oxidation-Washing

Colour Denim

- **Non mercerized/rope dyeing:** Dyeing-Washing-Oxidation-Washing
- **Mercerized/slasher dyeing:** Mercerising-Washing-Dyeing-Washing-Oxidation-Washing

Combinations with Indigo

- **Bottoming:** Sulphur dyeing-Washing-Indigo dyeing-Washing-Oxidation-Washing
- **Topping:** Washing-Washing-Indigo dyeing-Washing-Sulphur dyeing-Washing-Oxidation-Washing

Ecology*

- GOTS approved
- Oeko-tex approved
- Bluesign approved

Economy

- less water
- less time
- less energy
- higher machine utilization

Efficiency

- intelligent chemistry
- right the first time
- reproducibility
- performance

Environment

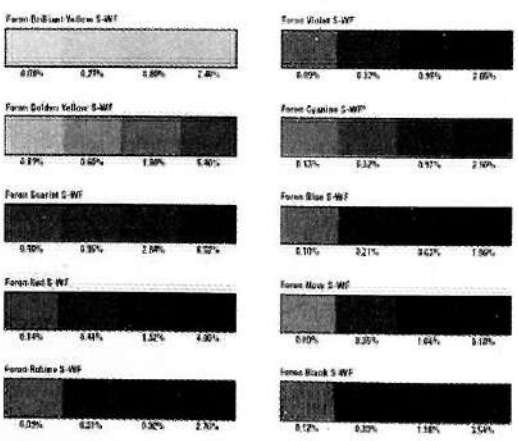
- less effluent load
- CO_2 saving

* For detailed product information see textile website www.textiles.clariant.com

4 Workwear

Dyeing & Printing

Targets of the SWFT process



Ecology*

- GOTS approved
- Oeko-tex approved
- Bluesign approved

Economy

- less water
- less time
- less energy
- shorter cycle time
- higher machine productivity

Efficiency

- performance
- reproducibility
- right the first time

Environment

- less waste water
- less effluent load
- fewer chemicals used
- CO_2 savings
- fewer pollutants

* For detailed product information see textile website www.textiles.clariant.com

Clariant Carpet Dyestuffs
for Wool and WO/PA
Optilan®, Lanasyn® and Nylosan®

Clariant Carpet Dyestuffs Optilan®, Lanasyn® and Nylosan® for Wool and WO/PA

In carpet manufacture, unlike many other substrate forms, the determination of levelness is only made when the final article is made – by which time if it appears unlevel, it is beyond repair and has also undergone many additional expensive operations (e.g. winding, weaving, backing, etc).

Optilan® E
Di - and mono - sulphonated selection for palest shades. Excellent leveling and light fastness behavior. Highest penetration even on high twist yarns. Tone in tone partition on WO/PA blends. Metal-free

Optilan® MF
Well balanced range for pale to medium shades. Medium wet fastness and good light fastness level. Good partition of WO/PA. Metal-free.

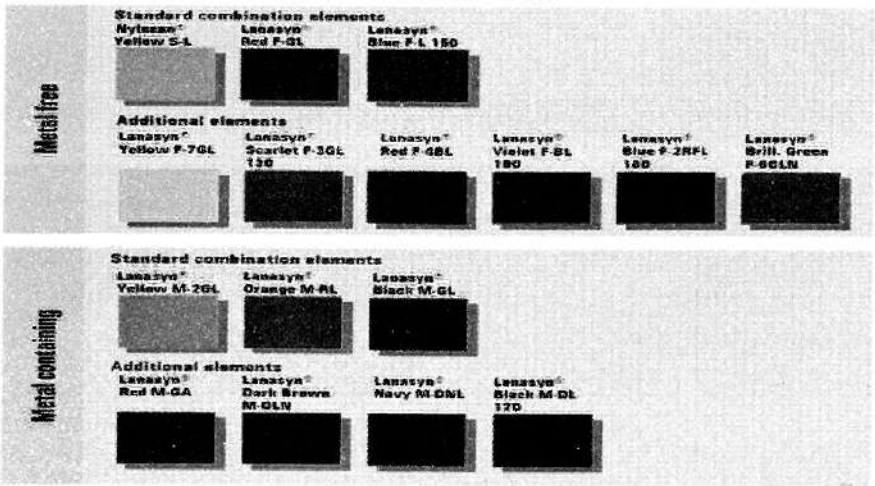
Optilan® MF-D
Developed to cover dark, classic wool carpet shades as red, navy, green and black. High wet fastness level despite good migration behavior. Tone in tone partition on WO/PA blends. High stability to prolonged boiling, sometimes necessary for full shades on difficult yarns. Metal-free.

Lanasyn® M
1 : 2 metal complex dyestuffs. Very high wet fastness level for dark shades on 100% WO.

The need for different dye classes is born out by the balance between leveling and fastness.

Clariant Carpet Dyestuffs
Chromojet Print on Polyamide

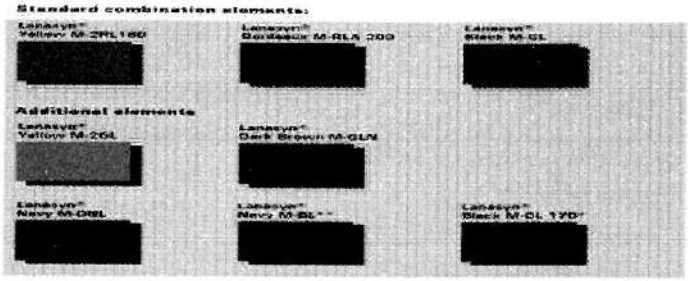
High fastness selection
Chromojet printing needs no screens and is revolutionary in its ability to create unlimited pattern repeats. Deepest colour penetration and excellent print definition are achieved by optimising the use of electronics, mechanics and chemistry.
In this regard the following dyestuff selection shows the highest wet and light fastness possibilities and is therefore suitable for domestic and contract qualities.
The compact range covers the whole shade area from brilliant to black.



Clariant Carpet Dyestuffs
Polyamide Automotive

Clariant
Exactly your chemistry

From the coloristic point of view, automotive articles have to mainly fulfill the demand of severe hot light fastness and to be free of metamerism. Together with **Fadex® PA liq** (fiber protector) **Lanasyn® M** form a package to reach that target. Additionally it is supported by a "Hot light fastness calculator", to forecast the expected light fastness rating.
For metamerism reasons the use of combinations of 4 up to 8 dyestuffs are sometimes inevitable. Good combinability is very important for both exhaust and continuous dyeing procedures.
The right selection of **Lanasyn® M** dyestuffs is therefore essential.
As levelling agent **Lyogen® NH liq** is recommended. It shows significant slow down of the first strike as well as an increase of the migration behaviour. Certain anionic auxiliaries should be avoided. Some of them can reduce the light fastness.



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Plenary Session 4

"Sustainable Consumption and Retail"

PROFILES OF THE SPEAKERS

Plenary Session *4* : *"Sustainable Consumption and Retail"*

TOM FISHER

School of Art and Design
Nottingham Trent University

Tom Fisher is a graduate in Fine Art, has worked as a furniture designer, and did his PhD in the Sociology department at the University of York. His current research concentrates on the materiality of human/ object relationships and their implications for sustainability. This interest encompasses the industrially produced designs found in every day domestic spaces such as plastic objects, packaging and clothes, as well as designs that come about through informal processes. In this he draws on his background as a maker and on perspectives from the sociology of consumption. He recently completed a research project for the UK government into the UK Public's understanding of sustainable clothing. He is currently working on a book for Earthscan about packaging reuse, with Janet Shipton, and is Professor of Art and Design in the School of Art and Design at Nottingham Trent University.

ATUL UJAGAR
Country Director
Nike's
South Asia

Atul is heading Nike's Apparel sourcing operations for South Asia, (India, Srilanka and Pakistan) since 2001 in the capacity of Country Director. The South Asian region, which Atul manages, exports over 23 Million units annually of Nike Apparel to global markets.

Atul is a bachelor in Mech. Engineering, New Delhi (1987-1991) and a post graduate in Apparel Marketing and Merchandising from National Institute of Fashion technology (NIFT Delhi 1992-1994)

Prior to the current India assignment, Atul has been working in S.E. Asia (Thailand and Indonesia) for several years where he managed key functions of apparel sourcing.

Atul' s leadership position in regional sourcing function alongwith being an integral part of Nike's global apparel supply chain enables him to draw from his invaluable insights and global exposure. Atul is credited with developing strategic relationships with vendors in the subcontinent with a few of them becoming Nike's topmost

sourcing partners. Atul has also been instrumental in building and aligning textile supply chains which never existed in the Indian source base earlier.

Atul is a 3-time "Nike Apparel Maxim award" winner and has also been felicitated with "Excellence Award for contribution to business and society" by NIFT in the year 05. Atul is AMCHAM-Bangalore chapter executive committee member and has also held leadership positions in a few other associations.

Ravi Seshadri presently works for Marks & Spencer as **Regional Head of Technology** for South Asia Region. He started his career in the Apparel Industry two decades ago after his Graduation & Diploma in Pattern Making & Designing and an Intensive training in the UK/Ireland funded by British Government body, Overseas Development Administration. During his training in the UK, Ravi was exposed to both Retailing & Manufacturing (High Volume / Highly Engineered production & Medium sized flexible manufacturing system). For a period of 9 years till 2006, he was one of the senior management team member and instrumental in setting up the Product Integrity function at Nike Sourcing office for South Asia. Presently at M&S, Ravi is responsible for the Technology function, where the office buys Clothing, Foot wear & Accessories to the tune of 250 Pounds from South Asia.

RAVI SHESHADRI
Regional Head of Technology
Marks & Spencer
South Asia Region

She has a Masters from the Philadelphia University, a PG Diploma from NIFT and a PG Certificate from Nottingham Trent University. She has worked in the US, Hong Kong and India in Apparel & Textile Companies and has been with the Pearl Academy of Fashion since 2001. Her research interests are Education, Employability and Supply Chain Efficiencies in the Apparel Industry. She has presented papers and posters in International Conferences including World Textile Conference Montreal,1994, NISTI N Delhi 2004, IFFTI Melbourne 2007. In April this year, she made a presentation at the Fashion & Textiles Museum, London on Sustainable Fashion.

NANDITA ABRAHAM
Head of Department of Business& Technology
Pearl Academy of Fashion.

Sustainable Consumption and Retail

Prof.Tom Fisher
Nottingham Trent University, UK

Where do UK consumers think clothes come from? Clothing ethics and the 'sweatshop'.

In recent decades much less clothing manufacture has taken place in the UK, therefore most consumers there have no direct experience of the conditions of clothing production they have little direct experience of where clothes come from. At the same time as manufacture has become a less palpable part of UK economy, media attention has introduced to consumers a new notion; the 'sweatshop' has become part of ordinary everyday discourse. The concept is attached to certain locations 'the far east', more specifically China and India.

Despite these sweatshops having real physical locations, for UK consumers their locations are imagined, not directly experienced. This abstract sweatshop only marginally relates to the diversity of conditions in actual clothing factories in countries where production now mainly takes place. The focus of this paper is not on these actual conditions, but on UK consumers' understanding of them.

Research conducted in 2008 for Defra has demonstrated that a spectrum exists in the relationship between consumers' understanding of where their clothes come from, and their actions, in terms of what they buy. The concept of 'sweatshop' allows consumers to distance themselves from the actual conditions of production, at the same time as being both a cause of anxiety about the source of goods and in some cases acting as a direct influence on purchasing decisions.

Introduction

This paper discusses how UK consumers think about where their clothes come from. It draws on results from qualitative research commissioned by the UK's Department of Food, the Environment and Rural Affairs (Defra) which aimed to gauge the degree to which consumers in the UK understand the effect that their clothing choices and habits have on 'sustainability' (Fisher et al 2008). The research focused on the social and environmental dimensions of sustainability to identify how people in the UK think they affect the wellbeing of other people and of the planet, through their choices of what clothes to buy, how to look after them and how to dispose of them.
This discussion is set against an industrial context where clothing manufacture is a much reduced part of the UK economy. It proposes that the concept that is most

readily used by the participants in the research to indicate the origin of clothes the 'sweatshop' indicates a particular way of thinking about where they come from, which has a new inflection and has distinct negative connotations from the point of view of social sustainability.
During the nineteenth century clothing manufacture became an important part of the economy of whole cities in the United Kingdom the transition from craft to mass production in Leeds, Leicester, Loughborough and other cities saw large numbers of people employed in factories made possible by inventions such as the sewing machine and the band knife. Even before industrialisation work in clothing manufacture was understood to be hard; English literature gives us examples of female characters such as Kate, the sister of Dickens' Nicholas Nickleby, who spend time in unwelcome employment as a seamstress. The effect of modernisation on the collective consciousness and on the individuals who worked in factories for poor wages and in unsafe conditions was in its turn considerable. The material facts of modern clothing production left a mark on the culture of the UK that was summed up in the term 'sweatshop' places where clothing workers were exploited and their health and wellbeing endangered.

While the word 'sweatshop' is still part of everyday speech in the UK, the nature of the population's engagement with the material facts of clothing production has changed, alongside changes in the connotations of the word. Employment in the UK clothing industry declined by half over the fourteen years from 1978 to 1992, though production remained at the same level. Between 1992 and 2002 both employment and output dropped by a further 50% (Jones and Hayes 2004). A continuing reduction in employment after the turn of the twenty first century can be read out of the fall in quantity of clothes exported by the UK, which has been accompanied by an increase in clothes imports. Between 2000 and 2007 exports fell from 71,913,242 to 15,478,385 while imports rose from 516,778,470 to 908,499,701 kilograms per year, (HM Revenue and Customs, www.uktradeinfo.com/). The clothes production activity that remains in the UK now tends to be concentrated on design and the production of niche products (Allwood et al 2006: 11).

Alongside the move of clothing production away from the UK and lower the prices that have followed from an increasingly de-regulated global economy, UK consumers have consistently bought more clothes year on year. Allwood et al (2006) indicate that expenditure on women's clothes rose by 21% between 2001 and 2005 and on men's clothes by 14% over the same period. UK consumers not only have more clothes, but seem to have a different relationship to them than in the past. Studies suggest that this means that an increasing amount of clothes are disposed of in the garbage as well as being stored in households (Defra 2006, Banim and Guy 2001). People in the UK buy more clothes, but may value them less, than ever before.

Uk consumers' change relationship to clothes: material to immaterial

These statistics seem to accompany significant changes in the way that UK

consumers deal with their clothing and engage with its materiality. Whereas in the past consumers' understanding of the source of clothes was likely to be grounded in some first hand knowledge of how clothes are made many older people living in the UK, may well have worked in clothing factories or other such places and been accustomed to the practice of mending their own clothing in the home this seems no longer to be the case. This changed perception of their source exists alongside changes in the way clothes are consumed in the UK. Consumers seem now often to behave towards them as if they are disposable commodities. They arrive from an ill defined 'somewhere' given an identity by a designer's name or a shop's brand, are used and then disposed of. They are not understood as having been made by processes people can directly relate to and in which they can intervene by making, altering and repairing them.

This change in relationship to clothes in use, from an engagement in processes of production and repair to disposability, was reflected in the research discussed here. Whilst many of the participants will have had the necessary skill to mend and alter their own clothing, few reported doing this and none reported making their own clothes, though some had earlier in life. The repairing that was reported was limited to sewing buttons back on or sewing up a seam and some participants indicated that they occasionally used repair services. In general, people relate to the maintenance of clothing not through the making or altering it, but through infrequent and relatively insignificant acts of repair.

In this respect the global economic context is mirrored at the level of individual domestic practices. As the economics of clothing production have changed its location it happens 'elsewhere' people in the UK have become more distanced in their everyday practices from their own clothes. In all but the wearing, and storing of clothing in the home, people's relationship to their clothes has become less materially engaged as the material processes of production have become literally distanced by being moved off shore. These processes have come to appear immaterial, by their very lack of visibility.

Changing materiality; changing clothing practices

The increasingly immaterial relationship people have to clothing deriving from their lack of contact with its production has coincided with an increase in the importance and visibility of the representational systems of fashion promotion that emphasise the meanings attached to clothing. It would be easy to assume, following Baudrillard (1994) that it is now these immaterial systems of meaning that determine relationships to clothing. Writing particularly about fashion, rather than clothes in general, Lipovetsky (1994) notes that it is the ephemerality of the contemporary fashion system that is its defining feature. A consequence of this ephemeraility is that people's relationship to fashion is essentially immaterial. The logic of this reasoning would have it that in an historical moment when fashion appears to be the most significant aspect of the way we dress, we have a less material relationship with our clothes than before.

But this way of thinking relies on a crucial distinction between items of clothing in the wardrobe and 'fashion' as it exists in representational forms. The logic outlined above is confounded by the fact that in reality, these two impact on each other. While fashion may receive more attention because of its visibility, leading to the assumption that in an era of 'fast fashion' the relations people have to clothing really are ephemeral and immaterial as new styles replace the old with greater speed, the materiality of the relationships people actually have to clothing remains significant. They exist primarily within the domain of what has been called 'ordinary' consumption (Gronow and Warde 2001) the quotidian routines of buying, wearing, laundering and storing of clothing. The relationships people have to clothing still have significant material aspects.

This is shown, for instance, through the attachments people have to their favourite clothing. Although the research discussed here indicates that it is no longer common in the UK for people to mend their clothing, the few instances where people did so were cases of prolonging the life of a favourite item, not a highly fashionable one; clothing which has meaning for its owner. For example one older woman, aged 60 and now living alone, repaired her gloves, noting that she

'feels sentimental about these gloves as it was one of the last things my late husband bought me back in 2003 not long before his untimely death. The gloves have a matching scarf with them. I repaired the right hand thumb which had worn into a hole'.

She was specific about their significance to her, saying 'I have preserved the life of these gloves and my memories'.

This account, and others that included a male who said that the only item he ever mended was his favourite denim jacket, because it was his favourite, reinforces Woodward's (2007) finding that items that people choose to mend are those that are cherished and that the activity of mending strengthens the emotional attachments to them. There are of course other motivations for mending clothes, such as financial economy and this is still a factor that motivates repair for instance one female participant who had children wanted to prolong the lifespan of items of clothing as long as possible. However, even when it is stimulated by financial considerations the practice of mending occurs in a wider strategy of caring for 'special' clothing; items that are seen as 'special' are taken care of more, which is turn has the effect of making the item even more cherished. Despite these examples of a materially engaged process of clothes maintenance, it seems to be common to deal with clothes repair in a more distanced way and this appears to be reinforced by a process of de-skilling as younger people neither have any contact with clothes production, nor acquire repair skills at school. Younger participants without clothes repair skills spoke of passing items of clothing to older family members to fix or taking them to the dry cleaners to sew up.

The changing idea of the 'sweatshop'

In these examples, and they seem to indicate the most common practice, clothes repair, like production, is happening 'elsewhere'. The material relationship that most people have with clothing is limited to buying, wearing, washing, storing, and does not include sewing, mending or making clothing. This limitation of people's material engagement with clothes coincides with the production of clothing taking place 'elsewhere' (to the UK) and this geographical distancing seems to go along with a conceptual distancing. For people in the UK many practices with clothing are immaterial not because of their relationship to fashion, but because they take place in an imaginary space. Manufacture and mending for UK consumers take place in a space of memory which is a fictive analogy to the place where clothes now may come from the 'sweatshop'.

'Sweatshop' was used frequently in discussions of the ethical aspects of clothing manufacture alongside 'fair trade' and 'child labour'. Although some people showed detailed knowledge of the process of clothes production, from cotton production to the manufacture of textiles and of clothes themselves, this was relatively rare. In most cases 'sweatshop' stood in for the whole commodity chain. This usage implies that what happens 'elsewhere' to produce goods is separated out from the act of buying clothes in a shop in the UK. Participants' awareness of this 'elsewhere', such as it is, comes through the internet, television, as well as advertisements for some large UK based companies. Ethical issues in clothing are currently the subject of significant media scrutiny and are something of a buzz concept (Black 2008).

Such concepts are often relatively void of content and this contemporary notion of the sweatshop is no exception it does not indicate deep understanding of current clothes production. It is notable that there were not disagreements over what the terms sweat shop or fair trade mean, even though people had different levels of knowledge about it its referent an 'other' place where clothes come from. The immateriality of the 'sweatshop' as it is currently understood in the UK coincides with clothing consumption being actually divorced from its material contexts of production. There seems to be some equivalence in this dematerialised vision of clothes production to the increasing immateriality of the meanings that come to surround contemporary fashion cultures observed by Lipovetsky (1994). The immateriality of fashion seems extended to how people think about clothes production.

Victor Buchli (2002) discusses Lipovetsky's thesis to argue that the immateriality allowed by the ephemeral passage of fashion results in more fluid possibilities. However, the immaterial concept of the sweatshop seems to run counter to what Buchli's proposes as it seems instead to have a fixed meaning. The imagined and the immaterial sweatshop does not allow multiple possibilities but to the participants in this research seems to function as a fixed concept associated with a generalised non-UK location people talked about 'producing countries' or 'poor countries'.

Specific locations such as Taiwan, India or China which were also mentioned but were represented as existing within this more generalised 'other' place.

This has the effect of constructing ethically 'bad' clothing production practices as located somewhere else. Though some participants showed genuine concern about the ethics of clothing production others were more equivocal about the issues at stake, mixing concern with suspicion. One participant stated sweat shops are located in 'poor countries', continuing in a vein that suggested a somewhat negative attitude to such places in that he associated them with deception:

'they come over with their cheap [clothes]...and they stick it into...[budget store] and some companies change labels where it says, made in UK'.

This individual is exonerating himself from blame for the working conditions that may be associated with a 'sweatshop' by asserting that the relationship to the supplier country is not transparent.

The variety of ways that consumers in the UK employ the concept of the sweat shop seems both to validate not changing some of their practices and to justify others. One common response to the ethical dimension of clothing consumption is to identify a lack of knowledge about clothing production.Further than this, what knowledge individuals do have does not necessarily affect their actions. Several participants asked 'how do I know' whether an item is made by people in good labour conditions; others suggested that even if an item is 'probably' made in a sweatshop they may buy it if they can't be sure. As one put it, although you might 'know that children are making all these products, you don't know which actual product has come in the shop that's been made by the child', therefore the item is bought anyway.

As the sweat shop is seen as being a concept that is abstract and indicates somewhere 'elsewhere', it is easy to avoid connecting it to a particular action or a particular item of clothing. Because the word indicates a category that is separated out from practices of which people have direct knowledge it has the effect of separating actions off from their possible ethical consequences. It is an imagined 'place' of manufacture which is dis-embedded from the materiality of the overall commodity chain and this seems to make it easier to smooth over ethical misgivings, especially when tempted by very low prices. As one participant put it 'I try not to think of the slave labour going on ... the price is so appealing'. This mirrors comments made by several people that indicate that they are so attracted by the cheapness of the clothing that they use the distancing effect of the nebulous concept of the sweat shop located in an unidentifiable 'elsewhere' to avoid thinking through the details of what it entails.

Such a response is not universal and for some their knowledge raises a more significant dilemma in terms of their own purchasing acts. One such person made a direct link between the processes of production and the implications of buying a

cheap item and rationalised what she imagined were necessarily poor employment conditions to reduce costs against the need for jobs: 'when I buy anything from [budget retailer] I try not to think about the conditions...and I have conflict within myself about that but I suppose you could say, rather they were employed with low wages than not employed at all'. She invoked the benefits of employment as a justification for her purchase. Other instances see people making a more active and concrete connection between the cheap clothes in shops in the UK and labour conditions, imagining 'thousands of Chinese people in sweatshops like going blind from stitching'.

While such statements make a definite connection between the ethics of production and of purchase, the imaginary 'sweatshop' serves to reduce the great complexity of the actual conditions of production, separating the consumer off from the consequences of the item they buy. For some the moral implications are clear, as conditions are vividly imagined. One participant equates the act of purchase with its implications saying that 'going out and getting a T-shirt from £1 is like really...funding a bad industry, you may as well go out and buy a load of drugs'. However, it is characteristic of such an imaginary category that it reduces the complexity of practice which is here crystallised into the figure of the young child or woman crammed into a sweat shop.

While the concept of the sweat shop is relatively fixed, and reduces the complexity of the actual conditions of production, there is a range of ways in which people relate their actions as consumers to this imagined sweatshop. At one extreme the concept allows people to understand the conditions of production as 'separate from me and therefore not connected to what I do'. Others feel a lack of knowledge about the concept as 'imprecise therefore not directly and tangibly connected to purchases I make'. Others again see it as cause for concern, but not to an extent that they will change what they do. Some see a direct connection between the conditions of production and their actions as consumers and will therefore not buy 'sweat shop' goods.

This range of responses can be usefully conceptualised through Anderson's (2006) notions of the imagined community. Anderson discussed how the rise of print capitalism meant that through reading the same newspapers and knowing each other through other media, individuals could imagine themselves as part of a collectivity an imagined community of people they had never met. In the example discussed here individuals as consumers place the people who produce their clothes in an imagined place, the sweatshop. Yet in contrast to Anderson's imagined community it works to distance and separate people from each other as the middle sections of the commodity chain are absent, or only very sketchily understood. These inflections of the contemporary concept of the sweatshop indicate how that the geographical disconnection of production and consumption plays out in culture and affects people as consumers.

It is notable that this imagined space is employed in different ways and has more than one set of consequences in its use. In effect, it can both serve to connect or to separate people as consumers from production. Although it does not operate as an element in a genuine imagined community there can be an element of connection between the imagined producer and the consumer in their feelings of culpability for the conditions of production. Such feelings of culpability have a particular character however, given that the limited power of the individual consumer and the low level of transparency in the highly complex global supply chain of clothes.

Conclusion

This paper has discussed the concept of the 'sweatshop' as used by contemporary UK consumers to indicate the source of their clothes. Based on qualitative research conducted for the UK Department for Food, Environment, and Rural Affairs (Defra), it has noted that this term has gained a particular inflection alongside shifts in the location of clothing manufacture away from the UK and the increase in a relatively 'immaterial' relationship to clothes although some clothes are cherished and contribute to their owners' sense of self, many are treated as relatively disposable. The term is used by consumers in the UK in connection with the ethics of clothing consumption and has come to indicate an abstract, little understood but ethically dubious location for clothing production. While in principle it refers to actual places, China, the Indian sub-continent, the Pacific Rim, in its contemporary usage it can serve both to note concern about and to distance consumers from responsibility for the conditions of clothing production. Lipovetksy's propositions about the immateriality of contemporary fashion were referred to in connection with the materiality or otherwise of consumers' relationship to clothes, noting that 'sweatshops' produce clothes that may or may not be part of the fashion system and which may or may not be cherished for their role in self identity. Anderson's concept of the 'imagined community' offers a way to understand the varying degrees to which consumers' use of 'sweatshop' connects them to others.

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(see http://www.defra.gov.uk/environment/consumerprod/products/clothing.htm).

The methods used combined focus groups with a home task in which participants completed a diary of their clothes acquisition, maintenance and disposal over a period of approximately a week.

The idea of the sweatshop was not an exclusively British one the word is used in north America to refer to the same exploitative labour conditions in clothing manufacture

Sustainability in Textile / Fashion Industry

Ravi Sheshadri
Regional Head of Technology Marks & Spencer South Asia Region

The textile/Clothing Industry in the developing countries has been the back bone to provide Quality Merchandise, ever since western countries could NOT keep up with the market pressure on cost and thus became almost non-existent in the last two decades.

Albeit the Industry endeavors to keep pace with the changes / challenges, it has always found the emerging situations / demands quite interesting, challenging and compelling. While the basic element such as Improved Efficiency / Prevention based Quality Systems are still being explored further to reach optimum levels, the focus on sustainability will be the next frontier.

This challenge will need to be taken up together between Manufacturers / Brands & Retailers with the support of customers. The Industry is beginning to think ways of

a. Reducing Carbon Foot print
b. Stop sending waste to land fill
c. Use raw materials from the most sustainable sources
d. Improving lives of people in the supply chain
e. Help Customers choose a healthy life style. .

This effort shall witness all round improvement on manufacturing / consumption practices & cost. The current life style is believed to "consume" resources required from 3 planets although we have ONLY one!! The Industry in the near future will begin to see the pace / momentum on this important topic.

Mapping the Life Cycle of a T shirt in India and its Relationship with Sustainability

Nandita Abraham,
Head of Department, Business and Retail, Pearl Academy of Fashion

Key words: sustainability, India, life cycle mapping, post consumer use, used clothing

Sustainability and Sustainable development is at the forefront of research and policy discussions today. The `responsible' Fashion Industry is studying its carbon footprint and tracking energy consumption and wastes which happen in the course of growing, manufacturing, consumer use and disposal. The figures are appalling showing high levels of pesticide usage, long distances traveled from fibre to garment distribution, huge CO2 emissions and large quantities of energy consumed. Additionally research shows in the UK that upto 80% of the waste actually happens during consumer use. Disposal is a nightmare in countries in Western Europe where the per capita apparel disposal into landfills is estimated at 30 kgs. This awareness is leading to a international movement which aims at responsible buying, the slowing down of fashion and fashion recycling.

The research conducted aimed to look at Sustainable Fashion and Sustainable Consumption, whether they can be generalized the world over or whether a tool box approach is more appropriate and required. The research studies India and issues that it faces under the sustainability umbrella, and throws light on sustainable practices.

To do this the paper tracks and compares the life of a T-shirt purchased in India with one purchased and used in a developed country like the US. It highlights the consumer and post consumer use stages as being the ones where the contrast is most evident. This paper would be of interest to members of the industry in India and those interested in sustainability issues worldwide. It would provide a framework for further research in the area of sustainability of fashion and micro enterprise in the Indian environment.

All photographs have been taken by Ms Mohammadi Khatoon, with the permission of the subjects.

1.0 Literature review and Conceptual Framework

The purpose of this study is to study the life of a garment in India and assess its sustainability. In order to do so an extensive literature review has been carried out.

1.1 Apparel Consumption and Trade

The apparel industry is worth over 1 trillion US Dollars per annum. Over half of this consumption takes place in America and Western Europe (Images Business of Fashion Yearbook 2008). In The UK the average consumer spends GB£ 780 per annum on clothing and textiles. In India this figure is closer to GB£ 30 (McKinsey 2007).

Interestingly the production side of this industry is focused on a different part of the world. Three quarters of the worlds clothing and textile exports come from the developing world. In some of these, for example, Bangladesh, the textile industry is responsible for large proportions of their total exports (70%). In India, the clothing industry is the largest manufacturing provider of employment and has a 3% share in the global garment export market (South Asia Economic Journal, 2007)

1.2 Environmental Impact and Consumer Awareness

Given the scale of the industry, retailers and brands are increasingly concerned with the environmental impact of their products. Driven by government policies and rising consumer awareness today companies internationally are tracking their carbon footprints. With regard to carbon footprints, the amount of carbon consumed, greenhouse gases emitted and waste generated by the apparel industry are being studied. Consumers are increasingly asking questions about the origins and journey of the product to market and making consumer choices based on environmental and ethical concerns.

Clothing companies are rapidly responding to this consumer demand, as these choices begin to hit their bottom line and are now publishing data about their carbon footprint within their own consumer literature and websites (www.marksandspencer.com, www.patagonia.com). Organizations like Forum for the Future, DEFRA - Department for Environment Food and Rural Affairs, and RITES - Return Intention Towards Ecological Sustainability are helping companies and manufacturers think through the environmental impact of clothing, share best practices and provide environmentally sound options for manufacturing, use and disposal of clothing. This has lead to a fundamental shift in the apparel industry towards considering the environmental impact of their business practices.

To understand the details of this impact this paper looks at a cotton T-shirt and studies the environmental impact at various stages in its life. Table 1 is a summary of different causes and their impact at different stages, manufacturing, logistics, consumer use and disposal.

1.3 The T shirt

1.3.1 Manufacturing

This stage starts with the fibre growing in the case of a natural fibre or fibre manufacture in the case of a synthetic fibre. Next the yarn is prepared and the yarn is knitted into a circular knitted fabric. Alongside, the same yarn is knitted into collars and cuffs for the T-shirt. The fabric and accessories are dyed into the specified colour and the fabric is then finished to the desired hand feel. The finished fabric is next transported to the garment manufacturer where it is cut into pieces, sewn and packaged for sale. Most prints, embroidery, labels etc are attached at this stage

During this stage fuel and electricity is used for machinery and production. Toxic material and

pesticides are widely used in cotton growing, pretreatment and coloring of fabric. Large volumes of water are consumed at this stage. All these impact the environment negatively and care has to be taken to use maximize production efficiency with minimum wastage.

1.3.2 Logistics

Today, each stage of the supply chain occurs in that part of the world which is has the most effective and economical process. The fibre for a T-shirt sold in Nevada may have been grown in Turkey, shipped to India for yarn spinning and knitting, sewn into garments in Bangladesh and shipped back to the US for retail sales. Labels, hangers etc are often manufactured in Hong Kong and distances traveled by each garment are often as much as 15,000 miles. (Rivoli, P 2005)

Fuel consumed in this process is generally overlooked as an environmental hazard and are not taken into consideration when sourcing decisions are made. As calculated by www.newscientist.com air miles expend as much as 105 times that of sea.

1.3.3 Consumer Use

During this stage the T-shirt is worn, washed, tumble dried and often ironed. Nowadays, garments are washed more to increase freshness them rather than for actual cleansing. Research shows that there are over 85 million washing machines in US homes each consuming 15,000 gallons of water per year. A T-shirt in the US goes through this process anywhere from 10 to forty times.

Apart from water, fuel is burnt to create electricity for washing machines and dryers. Approximately 80% of the energy consumption during the life of a garment has been attributed to consumer use.

1.3.4 Disposal

As per the Environment Protection Authority in the US, 85% of the 80 pounds of textiles that an American buys each year ends up in landfills. Figures in the UK are similar at 30 kgs per person.

Table 1 discussed that there are several impacts of clothing on the environment. In order to protect the environment, it is important that key sustainability issues are identified and addressed by the Industry

1.4 Sustainability in the Fashion Industry

Sustainability is the property of being sustainable. The World Commission on Environment and Development defines sustainability as "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs."

As the rhetoric and action surrounding Sustainability touches all industries around the world, the fashion industry has specifically brought this issue to the forefront in

Environmental impacts	Energy	Chemicals	Water	Waste
Manufacturing	Fuel for agricultural machinery and fuel and electricity for production.	Toxic material are used widely in cotton agriculture, pre-treatment of fabric, dyeing & printing	High volumes of water during cotton growing. Water used during wet processing and garment washing	Synthetics - Gaseous emissions and poisonous by products. Total raw material waste is equivalent to the weight of the T-shirt
Logistics	Fuel consumed during transportation – road and sea usually and air when required			Packing material for protection and presentation
Consumer Use	Burning of fossil fuel to create electricity for heating water and air in laundering	Chemicals are used in the washing process	Extensive use of Water during washing	
Disposal	Transport for collection and to land fill Energy during incineration			High waste volumes with US / UK consumers sending an average of 30 kg of clothing each year to the landfills

Table 1: Causes and their impact on the environment at different stages

various researches. The following Key Areas which affect sustainability have been collated as primary areas of concern from Forum for the Future and Well Dressed.

Increasing fashion consumption, lower price Fast fashion and increased competition have led to a steep increase in rates of purchase and disposal. Between 2000 and 2004, prices in the UK dropped by 14% and sales volume increased by 37%. The more garments purchased the higher the energy consumed and lower prices lead to shifting of orders to lowest cost factories encouraging low wage rate labour.

Cotton Production Cotton cultivation has become increasingly associated with severe negative impacts which include reduced soil fertility, eutrophication, salinisation, water pollution and pesticide related problems. People working in yarn production often have widespread lung diseases due to exposure to cotton fibres and chemicals.

Working Conditions Due to the widespread nature of the business and the difficulty of monitoring sub contractors, indirect workers and home workers it is difficult to monitor child labour, ethical conditions, fair wages and precarious employment.

Energy Consumed in Consumer Care Washing, drying and ironing often accounts for the most significant use of energy in western countries sometimes contributing 80% of the carbon footprint of clothing.

Chemicals there is a use of and release of toxic materials especially in wet pre treatment, dyeing, finishing and laundry.

Disposal Unsustainable manmade fibres have a long degradation in landfills. In the UK approx 1.9 million tonnes of clothing was purchased in 2005 and 1.2 million tonnes went into landfills or were incinerated. Only 0.3 million tonnes were resold or recycled through charities.

Fashion Miles transporting clothing components over such large distances produces carbon emissions contributing to climate change.

Table 2 allocates these issues into the Life Stages of a T shirt. It also shows average percentages that have been allocated to each stage in published data.

Environmental impacts	Key Issues	Energy Profile Approximations %	
		Data 1	Data 2
Manufacturing	Cotton Growth Chemicals Production Working Conditions	37	21
Logistics	Fashion Miles	6	4
Consumer Use	Care	60	75
Disposal	Disposal	-3	0

Table 2: Allocation of Key Issues and energy profile to stages of a T shirt

Data 1 Well Dressed
Data 2 Marks & Spencer

The energy expenditure is estimated at approx 109 MJ per T-shirt by Institute of Manufacturing (www.ifm.eng.cam.ac.uk). As shown in the profile most of the energy is used up during consumer use and manufacturing. Disposal does not account for any energy consumption in these profiles.

After disposal each garment is replaced and new energy is expended in the form of manufacturing and logistics. A reduction of disposal or a transformation of the disposed goods into a new product would undoubtedly help the overall environmental impact. Any system which encourages reuse of clothing would positively impact the environment.

Research based on environmental issues in the fashion industry have focused on a specific country and have looked at the primary environmental impact that the product has had during is first consumer lifetime. (Well Dressed, Patagonia, Forum for Fashion, Marks & Spencer) There is not much research done on the consumer and post consumer use of a garment in India.

2.0 Objectives

This paper contributes to the discussion in this field with a specific view on India. At

the same time it aims to explore an area where not much study has been done before. Life Cycle Mapping (LCM) of a T-shirt in India including Post First Consumer (PFC) Use.

3.0 Methodology

This is a study, involving interviews and focus group discussions. Triangulation of data collection methods have been used to look at the issue from as many perspectives as possible to gain insights into the environmental impacts. This provides insights from different perspectives of the individuals who participate in the life cycle of the T-shirt, from manufacturers, consumers, sellers, through the many re-use cycles of the garment

Study type	Participant / Subject	Type of information
Initial study	Secondary data	Lifetime impact of clothing database
Interviews	Industry experts	Stage variances and estimation of environmental impacts within India
Life Cycle Mapping	Importer – used clothing	Sources, rates, variety
	Traders – imported used clothing	Sources, rates, processes, distribution
	Bartan Wali	Process, volumes, profitability
	Traders - domestic used clothing	Process, distribution
	Fabricators – converting used clothing	Innovation, demand
	Fabricators – converting waste fabric to kids wear	Innovation, demand
	Used clothing retailers	Enterprise, demand
	Medical practitioners	Communicable diseases spread through used clothing
	First Consumers	Consumer lifecycle, garment care, disposal
	Consumers - used clothing	Use lifecycle, disposal
Visual Logging		Life Cycle

Table 3: Methodology

In summary, results of the data analysis are presented using 4 ideas

A. Life Cycle Mapping of T-shirt US & India
b. Comparative Lifetime Impact Grid
c. Post First Consumer - Environment Mapping
d. Energy Impact Comparison

4.0 Findings

4.1 LCM of T-shirt purchased in the US

Image 1 100% cotton T-shirt

The selected T-shirt was made out of cotton grown and spun into yarn in India. The yarn was then shipped to Egypt where it was knitted into fabric in one factory, dyed in the specified colour in a second factory and then cut and sewn into garments in another.

The packaged garments were then shipped to the US and kept at the Distribution Centre. From this warehouse the goods were sorted and sent via truck to the stores all over the US. The consumer bought this T-shirt and washed it after every use. After 25 washes it was disposed. It most likely went into a landfill but may have been incinerated or given to a charity as well.

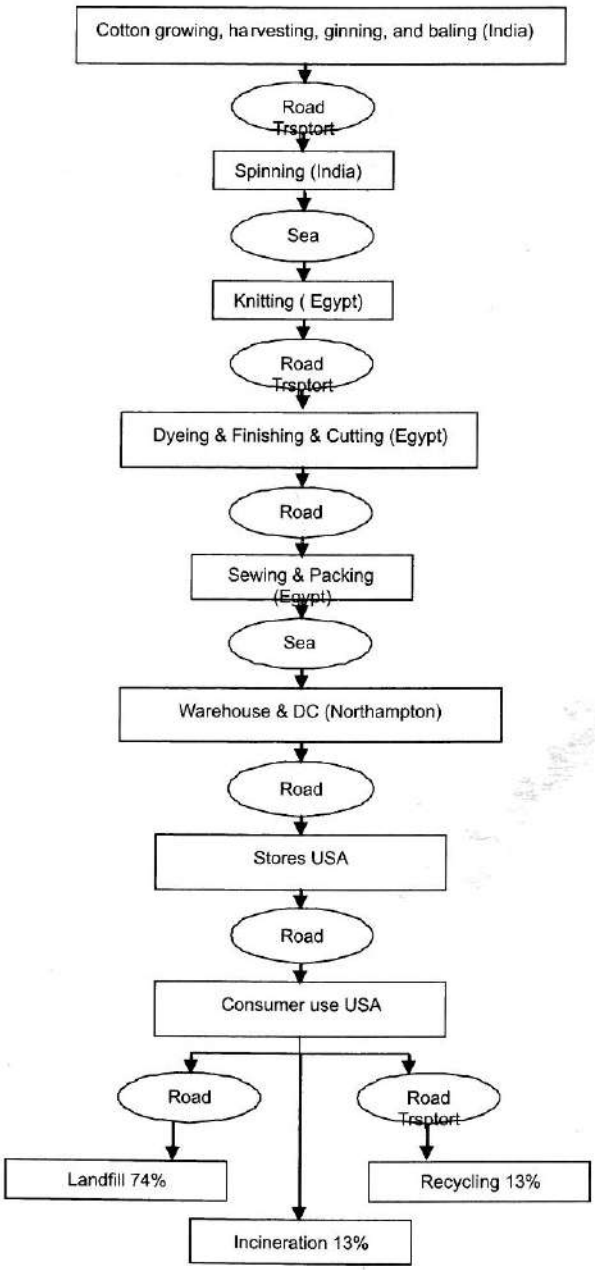

Figure 1: First Consumer LCM a T-shirt purchased in the US
Igure developed for this study

4.2 First Consumer LCM of a T-shirt purchased in India

The selected T-shirt was made of the same cotton and spun into yarn in a mill in Ludhiana from where it was shipped to a vertical knitter, dyer and garment manufacturer. The finished garment was shipped to the warehouse cum distribution centre in New Delhi from where the individual shipments were sent out to the various stores in India.

After purchase the consumer wore it for an average of 40 times where it was hand washed and line dried after every use. Soon the T-shirt in good condition was given to another family member for use.

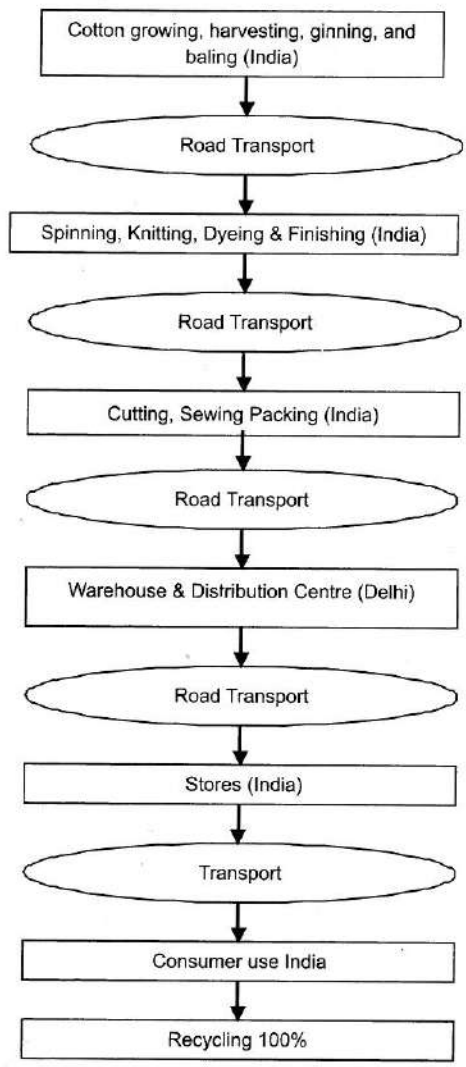

Figure 2: Life cycle of a T-shirt in India

4.3 Comparison of First Life Cycle Stages India & USA

When looking at both these life cycle we can see that in the early manufacturing stage, the base values for environmental impact would have been the same as the processes happen in an average mill in India.

The country average for production efficiency is higher in Egypt than in India. At the same time the T-shirt bought in India has used much less transport miles. Distribution and Retail Costs have been considered to be equal in both cases. Major contrasts are visible in consumer and post consumer use. These are discussed below.

	T-shirt USA	T-shirt India	India T-shirt Contrast
Raw material	?	?	
Production	?	?	Production efficiencies in India are lower than in Egypt and wastes are higher in India
Transport	?	?	The Indian T-shirt has Reduced fashion miles
Distribution & Retail	?	?	
Consumer Use	??	??	As the Indian consumer does not machine wash and tumble dry his garment, the energy consumed by the Indian T-shirt is much less.
Disposal	?	No impact	13% of the garments in the US are incinerated so the heat generated is taken as a positive energy impact on the environment. In India disposed garments enter a new stage

Table 4: Contrasts in First Life Cycle stages

High Impact	?	Low Impact	?
Higher Impact	??	Lower Impact	??
Similar Impact	?		

The Key Areas of Contrast are

Reduced fashion miles as all processes are within the country in the case of India - from growing to retail - fashion miles are greatly reduced

Highly reduced consumer use energy most garments in Indian Households are still hand washed and line dried. The washing machine is now becoming more common in middle class India. Even so data shows that 62% of middle class households in the top fifteen cities own washing machines. These cities consist of 10% of the population of India. In smaller towns the number of washing machines is fewer. Clothes drying is even more rare. The managing director of a multinational white goods company analysed this by saying `Clothes dryers are

meant for those living in extremely cold and humid environment. India is neither. Most clothes are hand washed and line / sun dried.'

Post First Consumer (PFC) This is the third area where there is a vast difference in the life cycles of the T-shirt in the two countries. The FC usage period is higher in India than that of the US. Fast Fashion as seen in the developed nations has not yet taken over the consumer. Brands still work on two to four seasons though this is changing. Therefore disposal rates are lower in India. The author further studied an area of major difference Post First Consumer (PFC) use of the T shirt. It was found that in India each T-shirt has at least 6 full PFC lives before being used as rags for cleaning.

4.4 Different Options Post First Consumer (PFC) of a T-shirt in India

William McDonough, architect and leader in the sustainable design movement, advocates the closed - loop concept "waste equals food". This phrase defines a concept in which objects that are ordinarily discarded as useless may instead be recreated into something useful (McDonough & Braungart, 1998). In India the life cycle of a T-shirt (any garment product) takes on approximately the same closed loop concept. Figure 3 shows the path a garment takes after the first consumer use in India. Over 80% of garments are handed down to someone within the family before their first disposal which may be commercial or in the form of a gift.

Option 1: The T-shirt is sold to a Bartan Wali A Bartan Wali is a woman trader of the Waghri caste who goes from house to house bartering new steel vessels for old clothes. This is a common practice and has been adopted by a few other communities as well as a viable occupation.

Image 2: A Bartan Wali from the Waghri Caste

These garments are put up for sale daily in open markets (from 4.30am to 10 am) (image 3) and large wholesaler traders come and buy the products. The market which the author studied in New Delhi had estimated sales of 80,000 to 100,000 pieces per shift. Interviews indicated that most of the products brought in were sold on the same day. At 10 am the Bartan Walis use some of their earnings to buy new vessels and go out to collect wares for the next days sales. The same market place is used by a second group of Bartan Walis from 2 7 in the evenings.

Image 3: Raghuvir Market in North Delhi

These wholesalers who buy these garments, sort them out and re sell them on one side of the market to a chain of traders who transport the goods to other regions of India. Pavement retailers buy these garments, and wash, iron and repair them where ever necessary. These garments are then sold in pavement markets which are a popular form of retail in India.

If a garment is seen to have a special value (gold thread work etc) it maybe sold to a specialist who eithr remakes them into ethic items like cushion covers etc for sale to tourists

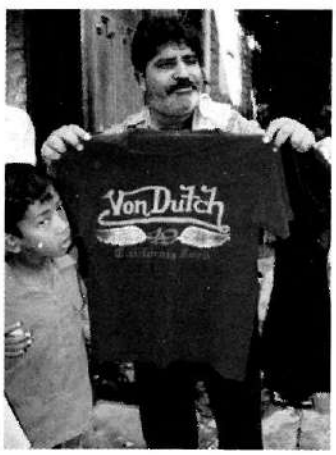

Image 4: A Trader showing a product that he has just bought

Image 5: Traders in the market

Option 2: Given to a household help. It is a common tradition to give used clothing in good condition to household help or someone in the vicinity of lower economic strata plumbers, cleaners etc. These are then used by two to three people in their families before being in turn sold to a Bartan Wali in exchange for new vessels for their households.

Option 3: Some families / organisations collect their old clothes and donate them to NGOs who in turn give them to needy people. Once used by 2 4 consumers within family / friends they are exchanged for new vessels to a Bartan Wali.

As most clothes today are disposed off when they are in a good condition, it was commented on in the Bartan Wali Market, that they sometimes see the same garment coming to this trading hub for resale 2 or 3 times.

Figure 3: LCM of PFC T-shirt consumed in India

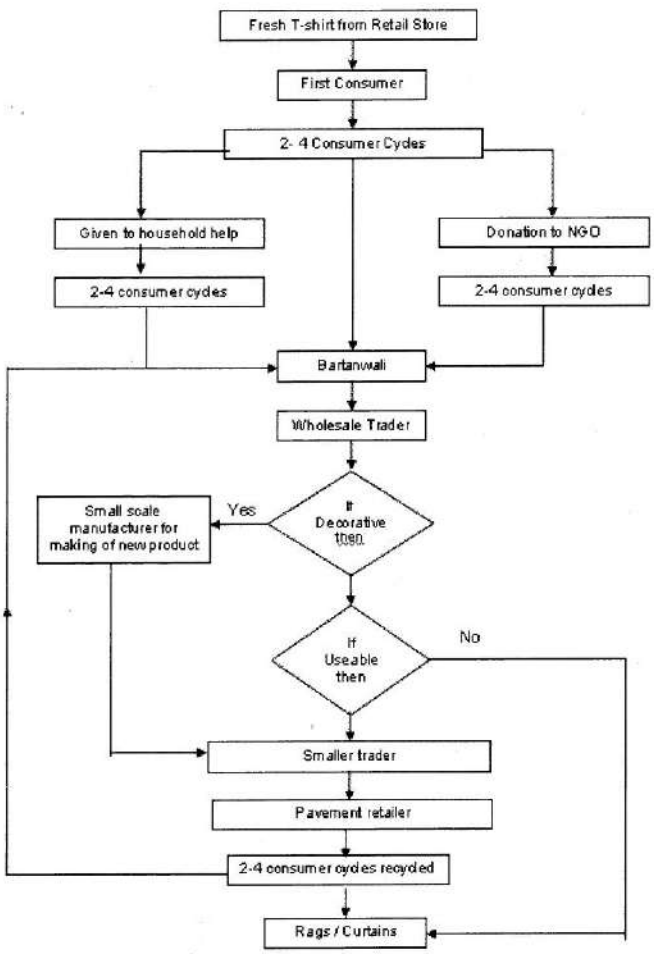

Figure developed by author

Following each of the options we can see that in all cases the product has a second life and a third and so on. In some cases these are just new lives for the product and in other cases there is enterprise and profit involved at various stages. Some products stay the same through their lives and some are transformed in the process. 100% of the garments are used until their final transformation into rags. No T-shirts go in the landfills in India.

Another related scenario in the Post Consumer used clothing is a huge trade in imported used clothing and scrap. These too enter the market as used clothing and clothe the masses of India.

4.5 Other ways used / waste garments enter the market

4.5.1 Import of used clothing into India : Large volumes of clothing are imported into India as used clothing and rags. This business is estimated at 200 crores. It is difficult to get an exact idea as some of these imports come in to the country as used clothes, some as donations for the poor, and some as rags. These are primarily imported from Canada, USA, Japan, UK and Korea. These garments are sold as imported in sealed bales of 100 500 kgs each (Image 6,7) to wholesale traders at approx Rs. 30 50 / kg who in turn sell the sealed bales to smaller traders. These traders in turn open the bales and convert them into bundles of a few dozens for further sale to pavement retailers. Once the consumer has used these garments they are generally handed down to one or two family members and then sold to the Barthan Wali in exchange for new vessels for their household.

Image 6 & Image 7: Bales of Imported used clothing
Image 8: Open Bales being sorted and made into smaller bundles

4.6 Manufacture of Childrens wear from waste cut pieces. Cloth traders buy leftover fabrics from mills and garment manufacturers. These are short lengths, rejects and cut pieces (waste from cutting). These are then stitched into childrens garments and sold to wholesalers all over who further sell them down the supply chain into stores and pavement markets. Childrens garments are mostly used by all the children in the family and then exchanged for new vessels from the Barthan wali.

All these eco systems are linked together by the inherent need for enterprise at the lower strata of the Indian Economy. Keeping in mind the demands of the consumer, often products are worked on to make them more profitable.

5.0 Value Addition on PFC clothing

The entrepreneur involved in the PFC clothing trade is aware of the need to position his product appropriately to his target market.

Some of the garments are cut and transformed into smaller sizes and childrens

garments. Plus size products are coveted by the traders as they are cut (bottom hem is generally frayed), all trims (buttons, zippers) rescued and sewn into smaller sizes.

Stripes and labels attached on all kinds of trousers to give them a sporty and aspirational look.

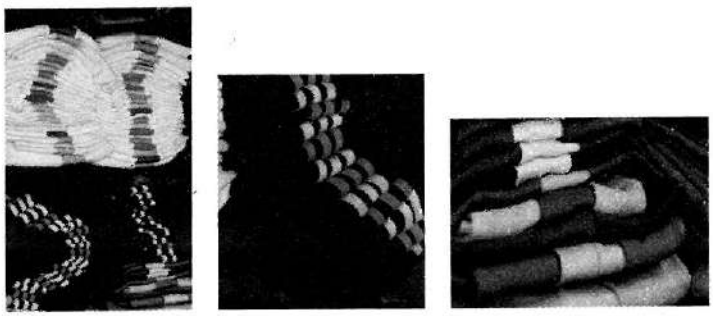

Image 9, 10, 11 Product Development in PFC clothing

PFC garments are often washed and ironed in mini factories in their own houses and made to look like new.

mage 12,13,14,15 Washing and Ironing of PFC clothing

S

ome traders individually pack the garments when preparing them for sale as this improves the presentation and may in turn bring them higher prices.

Image 16: Packaging of PFC clothing for re-sale

6.0 Post First Consumer Environment Map

A symbiotic use of all PFC clothing is optimized by the micro entrepreneurship of the Bartan Wali and various levels of traders from different parts of India. Figure 6 shows a combined flow chart which puts the Waghri community i.e. the Bartan Wali is at the core of this system and all garments new or imported from the US or made out of waste cut pieces is recollected and brought back to the primary market by them. After sale product is given a second life by the traders and retailers in turn.

Figure 4: Post First Consumer Environment Map

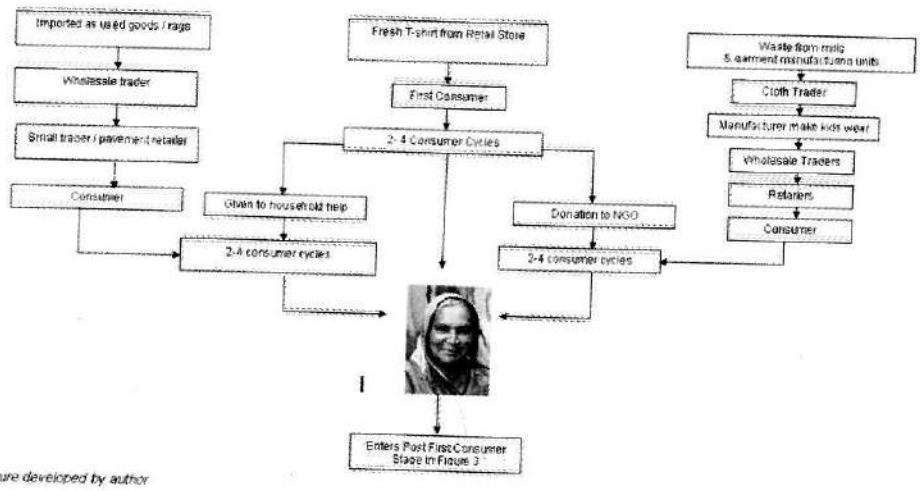

Figure developed by author

7.0 Energy Impact Comparison

The Environmental benefits of extending the life of a garment are evident. Each time a garment is recycled / reused instead of a new one being purchased; there is a reduction of impact on the environment. This is shown in Table 6.

Environmental impacts	Key Issues	Energy Profile Approximations for a T-shirt in Mega Joules			
		T-shirt in the US	6 T shirts in the US	Single Use India	5 PFC use in India
Manufacturing	Cotton Growth Chemicals Production Working Conditions	40	240	45	45
Logistics	Fashion Miles	7	42	2	8
Consumer Use	Care	65	390	20	70
Disposal	Disposal	-3	-18	0	0
Total		109	654	65	123
Average		109	109	65	20

Table 6: Average Energy profile of Various T shirts
Developed by author

It can be concluded that the Life cycle of a T-shirt in India is sustainable. It is also evident that the system of re-use of clothing that exists is one that has an incremental benefit on the environment.

At the same time environmental sustainability should not be promoted at the cost of the current well being of the society. The relationship between PFC use of clothing in India and the well being of its stake holders needs to be established before supporting this system wholly. Due to limitation of time the issue was not included in the scope of this paper.

8.0 Further Research Agenda

The author will continue this study by assessing the impact of the used clothing environment on the social well being of the stakeholders each within their social construct. This will take account for three dimensions of well being: the material, the relational and the mental (McGregor, JA 2007). For the purpose of the study the key stake holders have been identified as the bartan wali community, the traders, pavement retailers and the consumers of used clothing.

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Plenary Session 5

"Policy and Environment"

PROFILES OF THE SPEAKERS

Plenary Session *5* : *"Policy and Environment"*

MR. ALEX, WAI-HON YEUNG
Senior lecturer
Clothing Industry Training Authority, Hong Kong

Mr. Alex, wai-hon YEUNG, aged 48, is a senior lecturer of the Clothing Industry Training Authority, Hong Kong. Mr. YEUNG obtained a higher diploma in Textile Technology from the Hong Kong Polytechnic, a Master of Science degree in Technological Economics from the University of Stirling, UK and a Master degree of Advanced Business Practice from the University of South Australia. He is an Associate of the Chartered Institute of Arbitrators (UK), a Licentiate of the Textile Institute (UK) and a Member of the Hong Kong Institution of Textile and Apparel (HK). Mr. YEUNG has over 24 years of extensive technical management, academic and consultancy experience with various public listed textile manufacturing and merchandising, fashion branding and retailing companies in Asia. He is also serves as an executive committee member of the Hong Kong Institution of Textile and Apparel (HK) and the Honorary Secretary of the Textile Institute, Hong Kong Branch. He has published over 60 referred journal papers, conference papers & chapters, over 100 trade journals & newspaper articles. His current research interests are International Textiles Production & Marketing Strategies, Fashion Retailing & Branding in Asia, Service Quality management and Total Sustainability in the Global Fashion Industry.

PROF. DOUG MILLER
Design School at the University of Northumbria

Doug Miller is currently INDITEX/ITGLWF Professor in Ethical Fashion in the Design School at the University of Northumbria. Between 2000 and 2008 Doug was director of research at the Brussels based International Textile Garment and Leather Workers Federation which represents over 230 trade unions in 110 countries worldwide. Here he was responsible for research into supply chain developments, corporate social responsibility, and assisting the Global Union in its efforts to negotiate international frameworks agreements with leading multinationals in the sector. The first such agreement was signed in October last year with the Spanish retailer Inditex, owner of a stable of brands which includes Zara. In his new post Doug is responsible for developing a teaching and research strategy in the area of responsible design practice.

VINOD KAUL
Chairman
The Retail Vision Group
Gurgaon

Mr.Vinod Kaul is a seasoned professional with over thirty years of experience in the fashion, retail and the e-publishing industries in senior positions.

Hailing form Kashmir, Mr.Kaul obtained his graduate Honours degree (BSc.) from St. Stephen's College, Delhi. He subsequently did his Post Graduation (MBA) from the well know Indian Institute of Management, Ahmedabad, specializing in marketing.

Mr.Kaul's extensive experience in fashion and retailing includes eight years in Canada with importers and Canadian fashion retailers. In India, he has worked in senior capacities with Tata Exports Ltd., Bata India Ltd., DCM- Benetton India Pvt.Ltd., Birla VXL Ltd. and Raymond Ltd.. At Raymond he was instrumental in starting Be:, India's first chain of Designer Wear shops. Thereafter, for two years (2002-'04) he headed the Fashion Design Council of India (FDCI) as Executive Director. His tenure saw the FDCI bringing together the players in the nascent Indian Fashion Design movement and organizing them into an industry with international potential. An important vehicle for this was the annual India Fashion Week. A strategic direction was also set with the commissioning of the KPMG study that outlined the business-designer tie-ups required to move the industry forward in the next ten years.

In 2004, Mr Kaul inaugurated his e-publishing venture, RVG NewsVision. It now has six publications in the retail, fashion and luxury fields. RVG publications have a dedicated column on sustainable fashion.

Mr Kaul is on the Board of a number of Companies and Institutions.

Sustaining Sustainability in the Fashion Industry --- How is Hong Kong Doing?

Alex W. H. Yeung
Clothing Industry Training Authority, Hong Kong

Sustainability in the fashion industry is a significant and evolving trend that is likely to affect every facet of this globalized industry. While stakeholders had kept striving to proof themselves authentically sustainable-minded; only few significant achievements has been accomplished until now. The equation of sustainability remains imbalanced because the voice of manufacturer is always missed, if not ignored! Worsen the case is the lacking of a proper platform for dialogue between stakeholders when setting deliverable and the absence of a mutually acceptable mechanism to gauge the progression of achieving sustainability. Observed the gap in pursuance of sustainable development in the fashion industry, twelve Hong Kong based leaders in the global fashion supply chain, including the Clothing Industry Training Authority (CITA) launched the Sustainable Fashion Business Consortium (SFBC) on Earth Day 2008 for the purpose of bridging the gap with the voice of manufacturer. Hong Kong was selected to be the geographic location of hosting the SFBC because it has long been a leading fashion manufacturing centre and a global fashion merchandising hub and many major players in the global fashion supply chain headquartered at Hong Kong. Hong Kong certainly possesses a convincing capability to effectively sustaining a sustainability fashion business initiative. As an agent of change, SFBC has already started working on several transformational projects that not only benefiting its members, customers and suppliers, but also for the benefits of small and medium enterprises (SMEs) in Hong Kong and China. By doing so, SFBC will work well as a platform for dialogue between stakeholders when setting deliverable and a mutually acceptable mechanism to gauge the progression of achievable sustainability; and is very likely that it will become a role model in realizing the vision of sustaining sustainability in the global fashion industry.

Keywords: Sustainable Fashion Business Consortium (SFBC), Sustainability, Fashion Industry, Hong Kong, China

Introduction

Increasingly reflected in the urgent needs for reduction in the environmental impact, cutback in the exploitation of resources and elimination of inequities in labor practices, sustainability in the fashion industry is a significant and evolving trend that is likely to affect every facet of this globalized industry. Given that fashion enterprises should be very eager to show consumers a new sustainable approach; better responsiveness and affordability are simply inadequate once sustainability started to gather momentum in the global fashion supply chain.

Sustainability and Sustainable development

There are many ways to address the term "sustainability" and deserves much more elaboration than it seems to be. Ecologists have led the discussion of the term "sustainability" to the "limits of growth" (Meadows, Meadows, Randers, and Behrens, 1971) and used the term to describe an economy "in equilibrium with basic ecological support systems" (Stivers, 1976). To address environmental concerns, Daly (1991) presented the alternative function of a "steady state economy". In view of a systematic approach, the term was employed to describe the ability of an ecosystem to maintain ecological processes, functions, biodiversity and productivity into the future (REO Information Center, 2003). Developed through decades of transformation, the term "sustainability" has become a controversial and complex term that transcends disciplinary boundaries across our societal institution.

Being the mind the sophistication of the concept of "sustainable development", it plays a very special rhetorical role and has always been a heavily value-laden word. One of the most frequently cited definitions of "sustainable development" is the one articled by the Brundtland Report of the World Commission on Environment and Development in 1987 (United Nations, 1987) as the kind of "development that meets the needs of the present without compromising the needs of future generations to meet their own needs".

According to The Johannesburg Declaration on Sustainable Development, the "interdependence and mutually reinforcing pillars of sustainable development encompasses economic development, social development and environmental protection at local, national, regional and global levels" (United Nations, 2002). More broadly, sustainable development policies encompass three general policy areas: economic, environmental, and social (Figure 1). Only at a point where all three areas merge, is real sustainable action taken (Hershgal, Denner, Harush and Bitan, 2008).

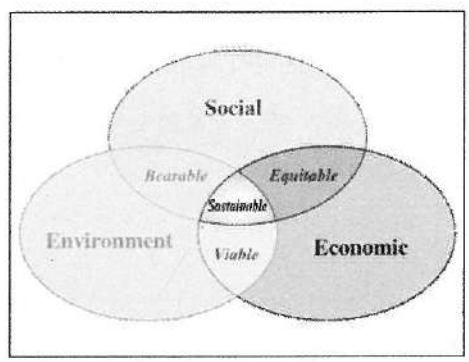

Figure 1: Scheme of Sustainable Development:
Three interdependence and mutually reinforcing pillars of sustainable development
(Source: Hershgal, Denner, Harush and Bitan, 2008)

Not surprisingly, the plethora of materialistically-focused or vague definitions which have found increasing favor in subsequent years has limited the credibility of the definition. This called into question its practical application and limited the progress in economical, environmental and social developments which it was designed to support. Johnston, Everard, Santillo and Robert (2007) estimated that there are some three hundred definitions of "sustainability" and "sustainable development" exist broadly within the domain of environmental management and the associated disciplines which link with it, either directly or indirectly.

Although sustainable development remains an irreducibly holistic concept that compels integration over perspectives, from the perspective of the fashion industry it can still be depicted as "satisfying the present needs for fashion but without compromising the ability of future generations to meet their own fashion needs". During last decades, stakeholders in the global fashion supply chain had kept striving to proof themselves authentically sustainable-minded, but only few significant achievements has been accomplished until now.

The equation of sustainability remains unfortunately imbalanced because the voice of manufacturer is always missed, if not ignored! Worsen the case is the lacking of a proper platform for dialogue between stakeholders when setting deliverable and the absence of a mutually acceptable mechanism to gauge the progression of achieving sustainability across of the global fashion supply chain spectrum.

Sustainable Fashion Business Consortium (SFBC) launched in Hong Kong

Observed the gap in pursuance of sustainable development in the fashion industry, twelve Hong Kong based leaders in the global fashion supply chain, including the Clothing Industry Training Authority (CITA) joined together and launched the Sustainable Fashion Business Consortium (SFBC) on Earth Day 2008 for the purpose of bridging the gap with the voice of manufacturer.

Founding members of the Consortium represent almost every sector across the global fashion supply chain spectrum, spanning from design to yarn-spinning, textiles to garment production. In alphabetical order, they are: the Ace Style Group, Central Textiles (HK) Limited, Clothing Industry Training Authority, Crystal Group, Fountain Set (Holdings) Limited, Glorious Sun Enterprises Limited, Gunzetal Limited, High Fashion International Management Limited, I Limited, Lever Style Inc., Sun Hing Industries Holdings Limited and TAL Apparel Limited. They manufacturing and supplies to major international retailers, including UK chain Marks & Spencer, Swedish store H&M and US retailers such as the Gap, Inc and JC Penney. All founding members of the consortium already have well-regarded corporate social responsibility (CSR) performances in place, and they believe the new alliance will give them a better platform to explain and expand the use of sustainable practices at the various stages of the manufacturing cycle.

In the SFBC, members should commit to the vision of creating more awareness for sustainability and to encourage sustainable practices across the fashion supply chain. Particularly, the SFBC aims to head up the necessary shared vision and experience; also to serve as the platform to encourage dialogue with other

stakeholders in better use of sustainable raw materials, reducing energy consumption, as well as the impact of waste and chemicals, good employment practices and fair trade.

To define best practices, members of the SFBC are dedicated to systematically monitoring their own operations, and setting measurable goals to improve the sustainability of their practices as an ongoing basis. Through its open architecture, best sustainable practices of the SFBC will be shared with the rest of the Hong Kong fashion industry through seminars and workshops to be organized by training institutions such as CITA. These seminars and workshops will better disseminate and familiarize other industry-players the use of new sustainable practices across the fashion supply chain.

Hong Kong was selected to be the geographic location of hosting the SFBC because it has long been a leading fashion manufacturing centre and a global fashion merchandising hub. Its significance becomes even more apparent following China's accession into WTO, Hong Kong and the Mainland China together represented some 30% of the World's clothing production and export in 2006 (WTO, 2007). In 2007, China increased its textiles and clothing sales to the USA by 14.8% in volume and 19.4% in value, despite quota restrictions on a range of products (Textiles Intelligence, 2008). EU imports from China rose by 14.3% to €27.5 billions, accounted for as much as 34.3% of the EU import market. In Japan, 83.9% of the clothing import market in 2007 was supplied by China alone. Output and investment in the industry in China expanded by over 19%.With many major players in the global fashion supply chain headquartered at Hong Kong; it certainly possesses a convincing capability to effectively sustaining a sustainability fashion business initiative. The move SFBC proposes is a milestone that could greatly strengthen Hong Kong's fashion industry, with its influences not only in Hong Kong and on the Mainland but also more broadly around the world.

Meanwhile, SFBC has started to discuss a number of projects with the Hong Kong Government (including the Project Blue sky), the Hong Kong Research Institute of Textiles, as well as active stakeholders such as the RITE Group and WWF Hong Kong to build up a sustainable roadmap for the fashion industry. SFBC has decided to support a WWF (World Wide Fund for Nature) project for Low Carbon Manufacturing in Hong Kong which aims to build a global standard for carbon footprint in the fashion industry. Streaming from carbon accounting to carbon benchmarking, and from carbon labeling until the stage of carbon trading; SFBC is looking into the possibility of generating financial incentive for further carbon emission reduction in the fashion industry through wholesaling carbon credits from emissions savings.

SFBC has also planned to host a Global Sustainable Textile Conference about sustainability in Hong Kong next year, together with the RITE Group (Reducing the Impact of Textiles on the Environment) in UK found by Marks & Spencer, University of Leeds and Ecotextile News. The conference will definitely put Hong Kong at the forefront of sustainable development in the global fashion arena. Other of the SFBC's initiatives in searching for excellence in sustainability include recycling

fabric from cutting lost to denim with 30% recycled cotton and efforts to more efficient energy usage.

If the SFBC succeeded in realizing its vision through all these initiatives, it will work well as a platform for dialogue between stakeholders when setting deliverable and a mutually acceptable mechanism to gauge the progression of achievable sustainability.

Conclusion

By officially launching SFBC on the Earth Day, it marks the importance of the issue of sustainability in the global fashion supply chain, and the determination of its founding members in taking lead as socially responsible industrialists. As an agent of change, it has already started working on several industry-wide transformational projects that not only benefiting its members, customers and suppliers, but also for the benefits of small and medium enterprises (SMEs) in Hong Kong and China to continuous improving their adoption of sustainable practices.

By utilizing the geographic advantage of Hong Kong in the global fashion supply chain, SFBC certainly possesses a convincing capability to facilitating the continuously adoption and improvement of sustainable practices industry-wide. By doing so, SFBC will work well as a platform for dialogue between stakeholders when setting deliverable and a mutually acceptable mechanism to gauge the progression of achievable sustainability; and is very likely that it will become a role model in realizing the vision of sustaining sustainability in the global fashion industry.

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Valuing labour the missing piece in the sustainability equation. A Discussion Paper

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Key words: Value Chain Analysis, industrial upgrading, FOB, buying practices, living wage

Some 30 years ago, the findings of the World Commission on Environment and Development developed a definition of sustainability, which for many still remains authoritative today. It stated that for an economy to develop in a sustainable way, it would need to meet 'the needs of the present without compromising the ability of future generations to meet their own needs.' (Brundtland 1987) The report highlighted three fundamental policy areas to sustainable development: environmental protection, economic growth and *social equity*: (author's italics)

'Meeting essential needs depends in part on achieving full growth potential, and sustainable development clearly requires economic growth in places where such needs are not being met. Elsewhere, it can be consistent with economic growth, provided the content of growth reflects the broad principles of sustainability and non-exploitation of others. But growth by itself is not enough. High levels of productive activity and widespread poverty can coexist, and can endanger the environment. Hence sustainable development requires that societies meet human needs both by increasing productive potential and by ensuring equitable opportunities for all.

At the time the Brundtland report was being written, the migration of textile and apparel production from Europe and the USA was well underway into Asia, the Pan European Area, and Central America fuelled by the quota system under the terms of the Multi Fibre Arrangement and ultimately superseded in 1995 by the 10 year phase out Agreement on Textiles and Clothing. The impending expiry of this agreement in 2005 (delayed for an additional 3 years due to the re-imposition of the China safeguards) which has led to considerable changes in production systems as national apparel sectors have scrambled to re-position themselves global value chain post ATC. Some countries and companies continue to view their economic performance strictly in zero sum terms i.e. increasing their national share in the world market at all costs (Porter et. al. 2007:52) rather than focus on industrial upgrading as part of a conscious strategic effort to assist their respective sectors to maintain their position and/or even move up the global apparel value chain. However, as Kaplinsky and Morris commented at the beginning of this decade, there has been a lack of correspondence between the growing global spread of economic

activities associated with meeting global needs and the incomes which arise from these activities. (2001:41). Now, in a period of rising cost of living, valuing 'labour' has become a crucial issue which has provided for industrial turmoil in a number of Asian countries. (Miller & Williams: forthcoming). This paper argues that without a reappraisal of the value of labour by all parts of the industry, current efforts to meet the needs of the present, most certainly will continue to compromise the needs of generations of worker families in the future. In examining a specific UK initiative to address this issue the paper poses a number of critical questions for consideration by industry stakeholders.

Manufacturing an undervalued link in the global value chain

'A garment's true value lies not in its label but in its workmanship'Christa Weil

In 1968 David Pye, the celebrated professor of furniture design, lamented the virtual complete absence of interest in the notion of workmanship as against an ever increasing preoccupation with the concept of design. 'Some materials' Pye argued promised far more than others but only the workman (sic) could bring out what they promised (18). Garment manufacture has been no different, with all eyes in the business in the buying countries focused on the catwalk and the creations of the designer rather than the skill of the tailor or seamstress who crafted the materials into a quality garment.

It comes thus as no surprise that the value chain the full range of activities required to bring a product or service from conception, through the different phases of production, to delivery to final consumers, and final disposal after use (Kaplinsky & Morris 2001: 4) - is sloped in the manner it is, with 'outwork, cut and make and cut, make and trim activities rooted at the bottom of the curve. See Figure 1. This is not an outcome of globalization per se, since apparel and textile workers were deemed members of the sweated trades in both Europe and the United States as their respective apparel industries took root in the late 19th Century (Bender & Greenwald 2003; Bythell 1978). However the particular configurations of national textile and apparel supply and value chains have to be viewed in the context of both the buyer driven nature of the global industry (Gereffi 1994) and the particular ways in which backward linkage and industrial clusters were shaped by the 'terms of trade' under quota.

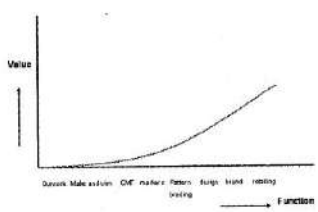


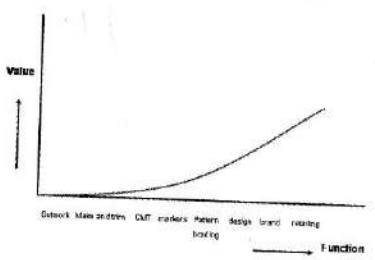
Figure 1: Added value in a clothing company

To survive in the post ATC world, a manufacturer can to add value in a combination of at least 3 possible ways. Firstly, a factory can simply upgrade its *processes* to achieve efficiencies thereby achieving productivity increases and a fall in unit labour costs. Secondly, a company may choose to upgrade its *product,* by moving for example from high volume low margin garments to garments with a higher value (Tewari 2007). Thirdly, a company may decide to *functionally* upgrade and acquire processes further up the value chain. Many first tier contractors have sought to consolidate their position by becoming full package suppliers with fully integrated operations and seeking long term partnerships with their buyers. Alongside these one stop shops, second and even third tier CMT operations continue to occupy positions in this value chain, at the bottom of which we find outwork or home-working (Impactt/Traidcraft 2008).

One type of upgrading which palpably has not been occurring is that of the value of labour towards a more equitable distribution of income in the sector. For this to occur, the added value curve would need to shift upwards as depicted in Figure 2 below. Globalisation in the sector has thus only served to transfer the ongoing undervaluation of artisanship into the supply chains of the multinational brand owners and retailers through continued downward pressure on price and national minimum wages held in check primarily by governments keen to attract foreign investors and companies hostile to the fundamental rights of freedom of association and collective bargaining. Consequently, we have now arrived at a situation where some national sectors (Bangladesh, Cambodia and Vietnam) (Miller & Williams forthcoming) have become quite volatile as food prices continue to rise and where malnutrition has now become a serious occupational health and safety issue. (Amarasinghe 2007)

A combination of tight operating margins, structural constraints as well as cultural values and gender segregation continues to militate against a sustainable system of worker reward in the apparel sector. Brands and retailers through their purchasing practices are heavily complicit in this. Figure 3 shows the cost components in the freight on board (FOB) price paid by a brand/retailer to a clothing manufacturer and/or their agent. It has been constructed using FOB data provided by a UK high street retailer for a plain cotton adult T shirt (as at April 2008), and costing formulae used by Nike in determining capacity and unit labour costs.

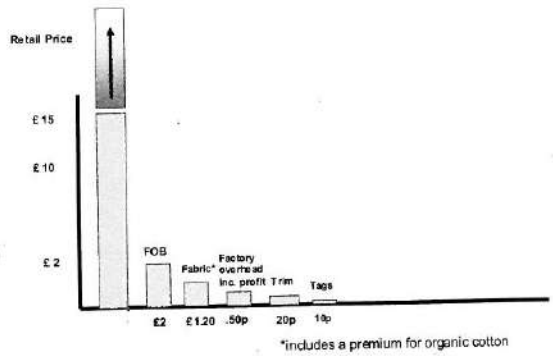
Figure 2 - Upgrading labour in the clothing industry



Source : Author

Fabric generally constitutes the highest cost element and the factory overhead/CMT element includes of course energy costs, profit and a labour cost, but generally the value of the labour input or unit labour cost is not transparent, at least not to the consuming public. To calculate this figure we need to know the manufacturer's current wage rates and the number and grades of workers who are required to achieve a required level of output. Average daily production targets for a sewing assembly line of 12 machinists supported by helpers with in line and end of line inspection, can vary between 800 and 1200 pieces. To calculate the direct unit labour cost one would need to include stores, laying up and cutting as well as washing, thread cutting and ironing and packing.

Figure 3: Value Added on a Plain Cotton T Shirt sold on a UK High Street



Source: Author

managers from Inditex, the following labour inputs would be required on average to produce a daily target of 900 T shirts:

Table 1: Labour inputs on a T shirt sewing line with a daily target of 900 pieces

Stores	4
Cutting (inc. 1 supervisor)	5
Machinists	12
Inspectors	2
Helpers	6
Washing and thread cutting	10
Ironing and packing	12
	51

Let us assume this production is occurring in Bangladesh, where the current national minimum wage rates were only revised in 2006 after a 12 year moratorium. We can arrive at a unit labour cost calculation based on a 26 day working month and a basic 8 hour day. See Figure 4 below. (NB: T shirt production in Bangladesh is not carried out under piece work and items such as meal and transport allowances are not

mandatory, while the annual 2 months bonus only applies to EPZs). Given the retail price elasticity of T shirts which can vary between £2 and upwards of £15 depending on the market by any stretch a unit labour cost of US$ equivalent of 6 cents should be a global scandal, particularly since there is general consensus on all sides of the industry that an increase of unit labour cost by an amount proportional to what is locally deemed to be a living wage would only marginally impact on the retail price of the garment. (Birnbaum 2000; Pollin et. al. 2004; Worker Rights Consortium 2005).

Figure 4: Unit labour cost calculation of a plain cotton T Shirt

Daily target 900 T shirts made in Bangladesh
Based on an 8 hour day x 26 working days per month on average

		Daily labour cost
Stores	4 @ 107 BDT =	428
Cutting	5 @ 86.5	432.5 note inc 1 supervisor
Machinists	12 @ 86.5	1038
Inspectors	2 @ 86.5	173
Helpers	6 @ 64	384
Washing and thread cutting	10 @ 64	640
Ironing and packing	12 @ 86.5	1038

Total shopfloor cost per day

$$\frac{4,133.5}{900} = 4.59 \text{ Taka}$$

= 3.9 pence

It is this realisation which has fuelled NGO and trade union living wage campaigns in the USA and Europe in particular. Our research found that basic rates of pay would need to increase by a factor of 3 to come anywhere near a living wage figures in a number of countries across the world. (Miller & Williams (forthcoming))

In the UK, persistent pressure (Labour Behind the Label 2006, 2007) has led certain member firms of the multi-stakeholder Ethical Trading Initiative to signal a willingness to address the issue of a living wage through supply chain interventions. A so-called wages pilot project consisting of 6 member companies sourcing from similar suppliers in Bangladesh has been underway to examine a number of questions which such an initiative throws up: how will such a re-valuation of labour be financed particularly in the current business climate? What method will be administratively the most efficient for transferring the increase? How can we ensure that the workers would receive it, and/or how can workers be empowered in the process? To what extent will buyers be able to act in concert in the light of existing competition laws? How would the issue of equity between workers in the same factory who are involved in lines producing for participating buyers and those which

are not? Let us look at each of these issues in turn. Financing the re-valuation of labour in the supply chain could be achieved by a marginal increase in the retail price. However, in the competitive high street this does not appear to be an option which many buyers are prepared to countenance. Other companies are looking at savings in their critical path (ETI 2008) although this work is viewed more as an effort to reduce bottlenecks which may impact on production and delivery deadlines. Others look to productivity increases on the part of their suppliers to deliver wage increases. Impact evidence is still largely anecdotal in this respect. Assuming an additional amount of money is found, how can a transfer be effectively administered so that it reaches the workers and critically that they are empowered in the process. The payment of a 'Fairtrade' premium has so far only been tried in soccer ball production in Pakistan approach and this, in line with the fair trade approach has gone into a welfare fund rather than be translated into a wage increase. For real wage increases to occur, suppliers would need to take seriously the core conventions 87 & 98 on freedom of association and collective bargaining and, accompanied by full transparency of those monies accruing to the workers, remind workers in non union workplaces of their right to unionise under national law as a way of accessing that money through collective bargaining.

Competition law as it is currently framed would seem to provide an obstacle to brand/retailer collaboration on this issue although the charge of price fixing belies the fact that labour constitutes only a small part of the ex factory price of an apparel item. Regarding the equity question pressure from other workers would soon be generated for other buyers to follow suit.

Beginning to reflect on these questions leads one to the conclusion that the present outsourcing and supply chain governance model makes the implementation of this crucial sustainability issue quite problematic. At a time when global food prices are beginning to soar, this conclusion is worrying. To address this problem, buying companies will need to not only monitor wages in their supply chains against available living wage benchmarks and engage in price negotiations based on a unit labour cost which is compatible with paying decent wages, and in conjunction with their suppliers create an environment in which the core rights of freedom of association and collective bargaining can be respected.

Conclusion

This paper has attempted to locate the wage issue squarely into the sustainability debate. The ongoing devaluation of labour in the value chain has meant unsurprisingly that efforts by manufacturers to engage in upgrading activities have left the re-valuation of labour off the agenda. Against the backdrop of spiralling cost of living increases, this has potentially grave economic and political implications. Given the complicity of western buyers in this process they have a responsibility to address this issue with their suppliers as a matter of urgency. This paper has hopefully tabled some of the questions they would need to address.

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Non Speakers

Suitability in textile industry from crop to shop Sustainable Clothing from mass to niche

Anuradha Modak

Textile Industry in India is the second largest employment generator after agriculture. Textile Industry is quite very unique in the terms, that it is an independent industry, from the basic requirement of raw materials to the final products, with huge value-addition at every stage of processing. Indian textile industry is constituted of the following segments: Readymade Garments, Cotton Textiles including Handlooms, Man-made Textiles, Silk Textiles, Woolen Textiles, Handicrafts, Coir, and Jute.

Recent market awareness of the escalating problems due to the deteriorating natural resources is helping to grab attention on the necessity to adopt sustainable and healthy lifestyles. Sustainability is defined "as balance between growing profitability, protecting the environment and promoting social responsibility Even Wal-Mart, has undertaken a major campaign to introduce organic foods and organic clothing along with sustainable business practices. Sustainable clothing and green eco fashion have entered the mainstream consumer consciousness with a huge media attention. Sustainable clothing is a product of the environmental movement. From the first step to the last step (crop production to distribution of the garment to the end consumer) then we are working on sustainable clothing .Sustainable clothing focus on the reuse and recycling of clothing.

Hopi Indians, a community dating back 5,000 to 10,000 years to the Aztecs era of Mexico, have developed a sustainable lifestyle and harmony with Nature that have allowed them to survive in peace in the arid and harsh environment of Northern Arizona. These groups of people were very much used the process of sustainability clothing in their culture.

If we just take the other side of the picture- related to sustainability .It is not necessary that sustainable clothing is at the same time healthy clothing. Its a study to attempt to understand the sustainable clothing market from mass to niche.

Sustainability in the entire supply chain starting from the crop (raw material) to the shop is the holistic management of fiber to fabric then to cloth and customer.

Key Words:

Sustainability, recycling, reuse, eco friendly

1. Introduction:

1.1 The concept of Sustainability in textile industry

Sustainable clothing and sustainable fashion is very subjective. Clothing that reduces the environmental impact. Clothing that supports and nourishes thez

earth and the lives of all people involved in the processes of growing, manufacturing and distributing the clothing. Reuse and recycling of manufactured product.

1.2 Myths About sustainable clothing

Many times Sustainable clothing is also confused with organic clothing .Is organic clothing and sustainable the same thing or different

The concept of "sustainable clothing" and "organic clothing" share many similarities, they have different roots and history. Where organic clothing grew and evolved out of the organic agriculture movement, sustainable clothing is a product of the environmental movement. They are both working towards the same ends but one has the feel of the farm and the other has the feel of the lab. One of the most apparent differences between the organic approach and the sustainable approach is the emphasis that the sustainable approach places on reuse and recycling of manufactured products. Improving a firm's sustainability process and reducing environmental impact is about more than just recycling materials. It requires a more holistic corporate approach that includes reusing environmentally-friendly packaging, reducing manufacturing and operational waste and pollution, improving building energy efficiency and reducing energy consumption, moving towards the use of renewable energy, improving shipping and transportation efficiencies, and designing sustainability into the products and services that are sold to the public.

1.3 Sustainable in a broader perspective

"Sustainable polyester" seems a bit of an oxymoron. Polyesters, nylons and acrylics are synthetic fabrics made from petroleum, a gooey and non-renewable resource. But, polyesters nylons and acrylics that have not been combined with natural fibers are considered by some standards to be a sustainable fiber because they can be recycled into new fabrics and into other products. Nylon is generally considered non-toxic although some chemically sensitive people report skin reactions from close contact with nylon. Acrylic is a suspected carcinogen. Plastic soda bottles, which are produced from polyesters, can be recycled and re-spun into fabrics and outdoor clothing that goes by a variety of names such as eco-fleece. Depending upon the definition and standard of sustainability, these fabrics which typically contain between 70% to 90% recycled plastics might qualify as being sustainable.

2. Methodology:

2.1. The study attempted case studies and thereafter conducting a case analysis for conclusions on the following parameters.

2.1.1 How sustainable clothing can elevate the life of poor tribal people.

2.1.2 Sustainable clothing for different segment of society.

2.1.3 How everyone from different segment can be encouraged to support sustainable cloth and other items.

2.2 The study is primarily exploratory by nature and uses extensive literature survey and observation method. The literature survey established the need for conducting the study further by using the case study approach.

Within that situation, the author's task was to understand what is happening and how the different topics will be manage then proper feedback is taken from the industry and NGOs about the feasibility. In the current scenario, study began with understanding of sustainable clothing market acceptability in different segment of market and industry it is done mostly through literature survey and observation.

3. Sustainable clothing elevating the life of poor tribal people

Today many things are done to improve the lives of tribal people. Tribal are the original inhabitants of a particular locality. Though almost all over the world tribal are found, India is a hub of different tribal groups, bigger and smaller. Due to typical life style, hilly/ mountainous or difficult geographical terrain as their abode, they could not get the fruits of development and advancement and could not be assimilated in the mainstream of national life. Though, in case of India, the govt. has formulated and implemented many programmes for tribal welfare and development, yet they lag far behind in the process. Most tribes have little experience running welfare programs, and important funding issues remain to be negotiated between tribal governments and states. Tribal areas around the country can be empowered in terms of procuring the raw materials for sustainable clothing from their resources from their areas and helping them to get better price rather than sharing the margin with the channel members .This will empower them to be independent and well connected with the outside world. The natural resources in their area like bamboo, extraction of silk from the wild silk can be use with the help of these tribal groups. At the end of the day they are certainly following the eco- friendly way of lifestyle. Sustainability is the way of their lifestyle. Their contribution to eco-friendly development and sustainability will be a remarkable one as in they will be a part of the supply chain, where they will get all the positive benefit out of it.
Slowly and slowly corporate firms should also come forward to not only procure the sustainable related raw material from tribal parts. But also through corporate social responsibility of their firm they can also uplift the lives of the tribal. The tribal as they are mostly uneducated, basic education could be taught to them with elementary computer operation. So that despite staying in remote land they can be well connected with the outside world

4. Sustainable clothing for different segments of society:
4.1 Clothing for poor:

If we segment the market interns of economic caliber of the segments we can have a broad classification of lower class, middle class and higher class in the society. India as a developing country is still struggling to provide food clothing and shelter for all or at least for the poor strata of the society, through this case study we can find a remedy for clothing for poor.
Recycling and reuse is the key term associated with sustainability. GOONJ is an NGO working on this line of action using one person's waste into another person's resources is trying to bring sustainability in the lives of common mass. Taking the idea of recycling waste to a whole new level is a great thought in action; the project

has become well established in a way that its distribution channels is able to reach even the poorest areas of India.

GOONJ collects unused clothing from all over India to then recycle the materials and provide clothes, sanitary and many other basic amenities to people living in poorer and very remote communities across the country.

There are more than 300 volunteers and mass participation of housewives, schools & Colleges students, corporate, exporters houses, hotels and hospitals behind the recycling and distribution center help to send out over 40,000 pounds of recycled waste materials every month across to the untouched remote areas of India.

There are more than 100 agencies working at the grass root level with GOONJ and spreading its arms to the 20 states in India .GOONJ has also won the prestigious Development Market place award from the World Bank on making a sanitary napkin out of waste cloth for the poor people in India .

4.2 Sustainable clothing for the high segment society:

As the poor par of the society is getting the benefit out of sustainable clothing .The rich segment, which is the better half of the society is also getting the benefit of being eco-friendly. The rich and the more educated part of the society are more aware about the issue like eco-friendly or sustainability. They are more and more encouraging towards eco friendly, which are made with chemical, more towards organic style of clothing. These types of sustainable clothing are more like a (wild silk)tassar shrit or sari or a bamboo fiber sari or shirt .They can pay the price so, they are using better side of the sustainable clothing.

4.3 Sustainable clothing for the middle class mass;

Middle class society is certainly the educated group but right now does have less awareness about sustainability but they are very aware about the ecofriendly approach of clothing. Despite having reasonable good awareness in the market, the middle class group prefers not to buy them in good numbers because the ecofriendly clothing which is marketed under the heading of sustainable clothing is the expensive version of fashion and fabric. As a result of this we can have an alternative of providing cheaper version of sustainable clothing that is to provide recycling clothing for price conscious people keeping the sustainable theme alive.

4.4 Sustainable clothing for kid wears segment:

In India Kid wear is one of the growing segments of market. Today's mothers are well aware about the availability in the market. Of all the major kids wear all of them provide clothing made up of cotton fiber. We can provide sustainable clothing by using bamboo fiber for kids .Bamboo fiber is used for kids wear in UK and other developed countries. Bamboo fiber have better absorbent capacity .So can be used very nicely for the infant wears. A focus group interview was conducted in Delhi metropolitan, with a sample size of 40 mothers to understand their response towards bamboo fiber clothing. They appreciated that they will accept this idea and like bamboo fiber clothing for their kids. Bamboo fiber clothing can create a revolution in kids wear segment.

(Bamboo fiber cloth for kids from website)

5. How different industry can promote sustainable clothing and other items:

Hotel and Restaurant Industry: If this segment of industry uses sustainability concept it will be very eco friendly and well as economical. In Hotels and restaurant table cloth is used ,which is generally made up of cotton or linen .Instead of this we can try making recycled sustainable table cloth which are more eco friendly. The aprons and the gloves worn in the kitchen can also be made through recycling.

Home Furnishing Industry: In home furnishing segment bamboo fiber bed sheet, bed cover, towel, curtains, cushion cover which will certainly support sustainable and eco friendly lifestyle. Cushion cover, door mat, table cloth made up of recycled, reuse fabric is a positive step towards sustainable lifestyle.

Security grads and education industry: Students and security grads uniform can be made of recycled fabric .Students trendy bags can be made out of recycled and use fabric for eco-friendly benefits.

Conclusion:

In every part whether its improving the lifestyle of tribal by making them a part of sustainable fabric procurement process or making sustainable clothing for everyone: poor, middle class, riches ,there is something or other for everyone that the benefit of being ecofriendly. The sustainable, recycled, reused clothing certainly do have much more longer lifespan and benefit for all. In some cases the benefits of sustainable clothing need to be properly communicated to people so that they can accept and adopt this concept faster than ever. Following groups can be made as per to the consumption of sustainable clothing/fabric.

Different groups	Sustainable clothing
Poor	Reuse clothing
Middle class	Recycled clothing
Riches	Sustainable fabric, organic
Kids wear	Sustainable fiber like bamboo
Hotels and restaurants/Home furnishing	Recycled fabric
Security guard and education sector	Recycled fabric

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SUSTAINABILITY OF FIBRE :
Theme: - Sustainable Production Process, Technologies and Ethical Issues

Mrs. Salju Jose, Fashion consultant and designer.

Sustainability is the core part of concern for preserving the world's resources. It means, you make something good for the environment, for the people who are using as well as the profit generated.

Cotton is the largest natural fiber supplying the global demand. Ecological and ethical concerns have moved towards fashion and textile industry. Cotton is sustainable, renewable, and biodegradable, making it an environmentally-friendly fiber. The companies and individuals all over the world are into a sustainability revolution.

In India, the chemicals are replaced by protein, Mexico uses an innovative technology to create clean water, The US involved in the magic of foam and in China, a massive plant is designed to produce energy and reduce pollution.

It is the responsibility of the community groups and international groups to create awareness to the cotton growers, manufacturers, customers, designers and the consumers.

India has started using enzymes for fabric processing and found good result in the feel of the fabric and the output. The working environment of the employees was improved along with the saving of water and energy. A technological marvel has derived in digital printing, by using special dye, which basically has no waste. The conventional technology using water to transport fabric during the dyeing process has been replaced by air technology, thus saving many gallons of water.

Our aim is to regulate cotton as a food crop, with minimum usage of pesticides.
Climate change, workers rights and pollution effects have to be a major concern for the corporate and design studio. Organic cotton is raw cotton that is produced without agricultural chemicals or chemical fertilizers.

The modern changeable trends and mass production of garments results in wasting heaps of environmentally friendly fiber. The designers could consider methods of producing textiles from these biodegradable fibers, with the idea that everything born from nature should also return to nature.

A STUDY OF CONSCIOUSNESS ABOUT ENVIROMENTAL ISSUES AMONG TEXTILE FASHION RETAIL PROFESSIONALS IN JAIPUR

Dr. Manoj Kumar, Pearl Academy of Fashion, Jaipur

The issues related to environment and sustainability is gaining its importance gradually across the industries and across the world. With rising consumerism and materialistic mindset, a large number of people have become concerned about the sustainability of this trend and various resources. There is a widely felt need of keeping an eye on the availability of resources and clean environment for future generations. The Dow Jones Sustainability Index defines corporate sustainability as "a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments."

Textile fashion industry uses plethora of resources and persuades people to maximize the use of products which results in ever-increasing usage of various kinds of resources. This also results in huge wastage and disposal problems including problems related to non-biodegradable substances. Retailers are at the end of distribution channel. They are in direct touch with consumers and act as link between consumers and industry. Hence their role in spreading the consciousness about sustainability and environmental issues and promoting environmentally safe practices is of paramount importance. This research paper is dedicated to the study of consciousness about sustainability and environment related issues among textile fashion retail professionals of Jaipur, the capital city of Rajasthan. This city has experienced the rapid growth of fashion products marketing and consumption in recent years. This study is based on the survey done of 250 retail professional sand entrepreneurs belonging to textile fashion retailing sector and working at different levels in different departments. The methods used for data collection are questionnaires and interviews. The prominent issues are related to consciousness among these professionals about environmental issues, major practices adopted by them for addressing these issues, problems faced by them regarding these issues, future plans related to these issues, their perception about consumer awareness about these issues etc. The research paper consists of analysis, interpretation and suggestions based on this study.

INTRODUCTION :

SUSTAINABILITY AND ENVIRONMENT :

Managing the environment is a task of paramount importance, but it is one of the issues which are ignored many more times than it is seriously taken care of. We must

realize that it is so closely linked with the development of human beings that overlooking it may cause danger to even the existence of civilization, and it can certainly cause the risk to sustainability of development. The question directed towards all of us is "Can we keep on going on the path of development without thinking how long can we go this way?" The obvious answer is that it is myopic and perilous to ignore the long term impact of our actions for short term gains. The future generation will not pardon us if we exploit the resources so blindly that it puts a question mark on the survival of future generations. The textile industry has been known as one of the major sector responsible for environmental damages. It uses around 2000 types of chemicals and a large amount of water. Hence there are various dimensions of environmental damages caused by textile industry.

This research is about the issue of sustainability in the area of textile industry. The research is focused towards studying the consciousness about environmental issues .For the sake of manageability it is confined to the study of consciousness about sustainability and environmental issues among fashion retail professionals in Jaipur.

Sustainability is defined as the capacity to maintain a certain process or state indefinitely (http://en.wikipedia.org/wiki/Sustainability)

Sustainability in broader sense includes the management of ecosystem keeping in mind both the ecological and economic concerns simultaneously.

Achieving environmental sustainability requires managing and protecting ecosystems to maintain both their economically productive and their ecological functions, maintaining the diversity of life in both human-managed and natural systems, and protecting the environment from pollution to maintain the quality of land, air and water.

(http://timesfoundation.indiatimes.com/articleshow/534219.cms)

Sustainable development is the only way to ensure the future development. It underscores that rate of consumption or use of natural resources should approximate the rate at which these resources can be substituted or replaced. We must be concerned about the environmental impact of processes we adhere to in order to satisfy our consumption needs. The pollution and hazards caused by the processes and the chemicals we use must not be overlooked

TEXTILE FASHION INDUSTRY :

Textile is one of the most basic and ancient industry. As clothing is the basic human need, the consumption of textile products is universal and ever expanding. Everyday new forms of textile products are invented and people across the globe keep on experimenting with various types of textile products. ***The** Textile industry **is a term used for industries primarily concerned with***

the design or manufacture of clothing as well as the distribution and use of textiles.

(Http://en.wikipedia.org/wiki/Textile_industry)

It has a long history. From the small scale cottage industry to the big mills of industrial era and then to the sophisticated production units involving the use of electronic appliances and IT ,it has gone through the long phase of continuous innovation and development.

There were various stages from a historical perspective where the textile industry evolved from being a domestic small-scale industry, to the status of supremacy it currently holds. The 'cottage stage' was the first stage in its history where textiles were produced on a domestic basis.

In the initial phases, textile mills were located in and around the rivers since they were powered by water wheels. After the steam engine was invented, the dependence on the rivers ceased to a great extent. In the later phases of the 20th century, shuttles that were used in the textile industry were developed and became faster and thus more efficient. This led to the replacement of the older shuttles with the new ones.

Today, modern techniques, electronics and innovation have led to a competitive, low-priced textile industry offering almost any type of cloth or design a person could desire. With its low cost labour base, China has come to dominate the global textile industry.
(http://www.economywatch.com/business-and-economy/textile-industry.html).

Fashion is closely linked with textile. Whenever we talk of fashion products, we first of all think about textile products, as the fashion is most profoundly pronounced through fashionable clothes.

Fashion *refers to styles of dress (but can also include cuisine, literature, art, architecture, and general comportment) that are popular in a culture at any given time. Such styles may change quickly, and "fashion" in the more colloquial sense refers to the latest version of these styles. Inherent in the term is the idea that the mode will change more quickly than the culture as a whole.*
(http://en.wikipedia.org/wiki/Fashion)

India is the home to one of the fastest growing fashion industry in size and diversity, due to its vast population and fast economic growth.
THE INDIAN fashion industry has certainly come off age since the days when all that it could muster were the names of a few known designers like Rohit Bal, JJ Valaya, and Ritu Beri in the circuit. The present fashion circuit is laden with several talented designers who are well known for their expertise in their respective domains, not only in the national arena, but in the international podium as well.

India is one of the oldest civilizations in the world, presenting itself as the converging point for a large number of cultural groups professing varied customs and traditions.

(http://en.wikipedia.org/wiki/Fashion)

ABOUT JAIPUR:

Jaipur is the capital city of Rajsthan.It is one of the fast developing cities of the country in terms of population and economic development. It is known as Pink City, was founded in 1727 AD by one of the greatest rulers of the Kachhawaha clan, the astronomer king Sawai Jai Singh. It is called pink city due to the fact that the pink color was used at the time of making to create an impression of red sandstone buildings of Mughal cities - and repainted in 1876, pertaining to the visit of the Prince of Wales.

It is situated at the distance of 262 kilometers from New Delhi, and is very well connected by road, rail and air. It has a fast developing textile industry and has plethora of retail stores dealing in textile products.

OBJECTIVES OF THE RESEARCH

1. To know about the awareness of fashion retailers about issues related to sustainability and environmental.
2. To know about the fashion retailer's perception about government measures to tackle sustainability in textile industry.
3. To know retailer's awareness about problems caused by environmental hazards in textile industry.
4. To know fashion retailers perception about environmental damage caused by different textile units.
5. To know about the opinion of fashion retailers about controlling the environmental damage caused by textile units.
6. To suggest measures to raise awareness about sustainability in textile industry.

RESEARCH DESIGN

The present study is mainly of descriptive type with the field study and the data has been collected by the use of questionnaires and interviews. The study is based on the inputs of 250 respondents. All the respondents are the textile fashion retail professionals. These respondents are either the owners of textile fashion retail outlets or working at managerial or executive levels. These 250 respondents were chosen using the Stratified Random Sampling.

This sampling procedure may be summarized as following:

1. The universe to be sampled is divided (or stratified) into groups that are mutually exclusive and include all items in the universe.

2. A simple random is then chosen independently from each group or stratum.

It was ensured that representative sample truly represents the universe i.e. Jaipur city of Rajasthan. The textile fashion retailers from the different parts of the city and of different sizes were selected for this purpose. The data was collected through questionnaires filled by respondents, telephonic interview and interviews.

ANALYSIS AND INTERPRETATION

1) **Awareness about the environmental hazards**:-This study was done to find the awareness about environmental hazards caused by textile units among textile fashion retail professionals. The findings are as shown in following table :

Table-I Awareness about environmental hazards		
Response	No. of Respondents	Percentage
Yes	208	83.2
No	42	16.8
Total	250	100

It is evident from the above table that

- Majority of respondents (83%) are aware about environmental hazards.
- Only a few (17%) of respondents are still unaware about persisting environmental hazards.

2) Study about the environmental hazards caused by textile units to various natural resources as perceived by fashion retail professionals:- This study was conducted to know what fashion textile professionals think about the environmental hazards caused by textile units to various natural resources. The findings are as shown in following table:-

Table-2		
Environmental hazards caused by textile units		
Response	No. of Respondents	Percentage
Air	33	13.2
Water	79	31.6
Soil	33	13.2
All	80	32
Cant say	25	10
Total	250	100

It is evident from the above table that

- Majority of respondents answered that major pollution is done to water bodies (32%)

- Same number of respondents (32%) answered that the textile units cause an equal amount of hazard to air, water and soil.
- An equal number of respondents (13%) answered that the textile units harm air and soil
- Only 10% of respondents did not come up with an answer.

3) Study about the results of environmental hazards caused by textile units-This study was done to know about the perception of textile fashion professionals regarding the results of environmental hazards caused by textile units. The findings are as shown in following table:-

Table-3

Environmental hazards caused by textile units

Response	Number of respondents	Percentage
Water crisis	81	32.4
Health problem	104	41.6
Economic problem	34	13.6
Other problems	31	12.4
Total	250	100

It is evident from the above table that

- Majority of people (42%) opine health problems as a consequence.
- A still high percentage of people (32%) feel that water crisis is natural consequence.
- Economic problem is opined by 14% of people.
- Only a few (12%) of people see some other kinds of problems as consequences.

4) Study about the environmental damages caused by different types of textile units:-This study was carried out to know the perception of textile fashion retail professionals about the environmental damages caused by different types of textile production units. The findings are as shown in following table:-

Table-4		
Textile units causing environmental hazards		
Response	No. of respondents	Percentage
Dyeing and printing unit	168	67.2
Weaving unit	31	12.4
Yarn spinning unit	21	8.4
Fabric finishing unit	30	12
Total	250	100

It is evident from the above table that

- Majority of respondents find Dyeing and Printing units as responsible for environmental hazards (67.28%).
- A smaller percentage of respondents (12%each) feel that weaving and fabrics finishing units are responsible for environmental damage.
- 8.4% of respondents feel that yarn spinning units are responsible for environmental damage.

5) Study of the sufficiency of government steps to control environmental hazards caused by textile units:-This study is related to know the opinion of the fashion textile retail professionals whether the steps taken by the government to control the environmental hazards caused by textile units are sufficient. The findings are as shown in following table :-

Table-5		
Actions taken by government to control environmental hazards		
Response	No. of Respondents	Percentage
Yes	103	41.2
No	87	34.8
Cant say	60	24
Total	250	100

It is evident from the above table that

- Majority of respondents (41%) are satisfied with the steps taken by the government to control environmental damage caused by textile units.
- 35% of respondents are not satisfied with the measures taken by the govt. in this regard.

- Other 24% of respondents could not provide any definitive answer.

6) Study of opinions of ways to control the environmental damages caused by textile units:-This study was done to find the opinions of textile fashion retail professional about the pertinent ways to control the environmental damages caused by textile units. The findings are as shown in following table:-

Table-6

Suggested steps to control environmental damage

Response	Number of respondents	Percentage
Use of eco-friendly fabric	103	41.2
Textile unit should be cut down	29	11.6
Government should take more strict action	92	36.8
Other	26	10.4
Total	250	100

100

It is evident from the above table that

- Majority of respondents (41.2%) suggested the use of eco-friendly fabric.
- Around 37% of respondents want that government should take more strict action.
- 12% of respondents want that the number of textile units should be cut down.
- The remaining few suggested any other option.

FINDINGS & SUGGESTIONS :

FINDINGS:

The findings of the research can be briefly summarized as following:

1) There is large scale awareness among fashion retail professionals about the environmental hazards caused by textile industry, but unfortunately all of them are not aware about it.

2) Most of the respondents are aware of the fact that textile units cause environmental hazards related to water, soil and air.

3) Textile fashion retail professionals are aware that the presently used processes and chemicals result in problems related to water crisis, health problems and economic problems.

4) Most of the respondents perceive that dyeing and printing units are the most responsible among textile production units for environmental hazards. Some of them find weaving and yarn spinning units responsible for environmental hazards.

5) Many respondents feel that the government has taken sufficient steps to control environmental hazards caused by textile units, but others are not satisfied with the efforts made by the government.
6) Fashion retail professionals feel that the use of eco-friendly fabrics and strict actions by the government can be the solution of environmental hazards caused by textile units. Few of them even advocate the cut down of textile units.

SUGGESTIONS:

1) There is an urgent need to raise the consciousness about the environmental hazards caused by textile units. If the awareness about the environmental hazards caused by textile units has not percolated down to everyone in textile fashion retail sector, it is a cause of concern. The govt. and voluntary organizations must work toward raising the consciousness about the environmental hazards caused by textile industry.
2) There is a need for the formulation of comprehensive policy for controlling the environmental hazards caused by textile industry and to control the damages caused to health and to solve the problem of water crisis.
3) The policy formulators must look urgently and deeply into the issues related to environmental hazards caused by dyeing and printing units and weaving and yarn units. Efforts should be made to find out technical substitutes of these processes which are environmentally safe and economically viable at the same time.
4) Government must make new efforts which can make people feel that the govt. is serious about the environmental hazards caused by textile units. It could be complemented with promotional messages by the govt. in mass media and stricter adherence to policies framed for controlling environmental hazards.
5) The use of eco-friendly fabrics should be promoted through fiscal and other measures by the government
6) The professionals in textile industry including textile retail professionals should make proactive efforts to solve the problems related to the environmental hazards caused by textile units.

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Cost effectiveness of Organic Cotton for the Export Industry

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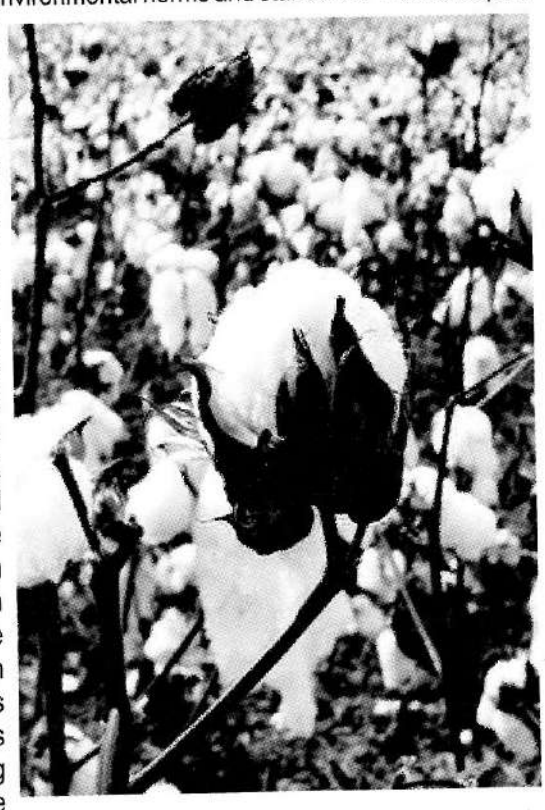
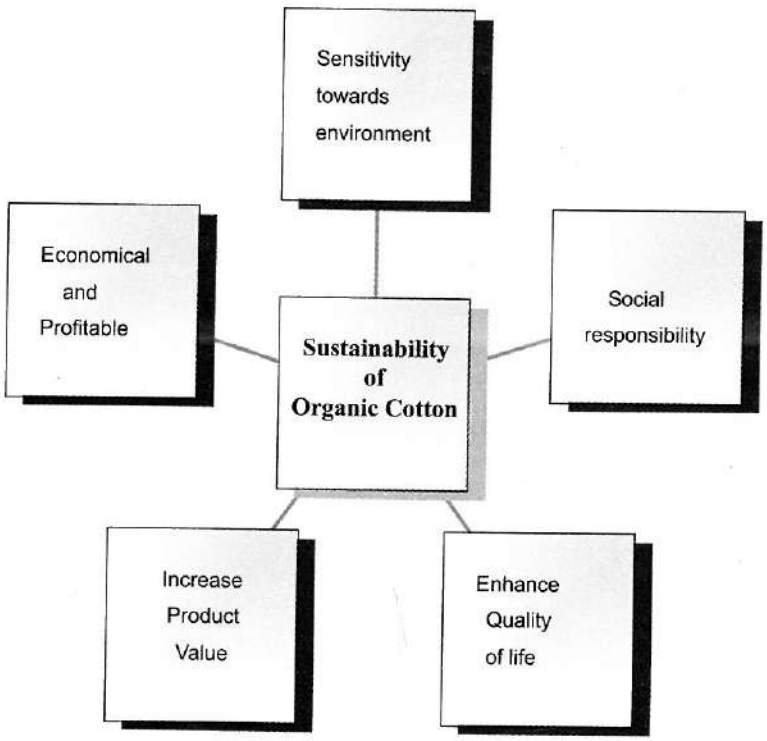
INTRODUCTION

Consumers today are health conscious and make attempt to go the natural way. This could be by using organic food, going to spa, performing yoga exercises and wearing organic clothes. Organic cotton clothing is fashion statement today. This pattern of life is for a limited segment of population and can be labeled as a *'lifestyle product'*. The 'Green movement' is in fashion because of consumer demand and corporate social responsibility. It is difficult to define being totally green. Green in our industry means complying with environmental norms and standards. The concept of 'back to basics' has influenced lifestyles around the globe. This is because of health concerns, environmental issues and social responsibility to commit to global cause. The word organic means to grow without the use of synthetic fertilizers, pesticides or any other harmful chemicals. In Europe and America consumers are choosing to be more informed about, where and who made their fashion items. This is still a new concept in India and consumer awareness of where and how the product has been manufactured is not an important concern for the majority. At a time when fashion is moving so fast cutting across all boundaries fashion ethics is the epicenter. People are taking about carbon foot prints of the product which is major issue of debate today. The new generation wants to see their products not having any implications and side effects on the environment.



To balance all aspects of becoming organic one has to consider the following :



Ecology is a major issue today not only for fabric producers who have to meet stringent laws. Also fabric vendors and exporters have to make sure that their products are free of the banned chemicals for global market. The demand for producing cost effective ecologically friendly goods for U.S and Europe market has led to extra pressure on Asian countries. Many companies are adopting not only the use of ecologically friendly fibers but also 'green' fabric processing techniques along with sustainability goals for the global market. The growing awareness of consumers for eco products will strengthen the quality of production processes.

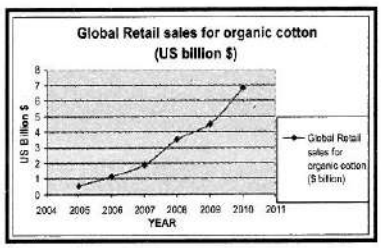
GLOBAL MARKET SCENARIO

Cotton has a huge global fiber production with an annual estimated turn over of 25 million tonnes. Cotton is produced in more than 100 countries and some 350 million people are employed in this industry worldwide. However, so far organic cotton production has only 0.1% share of the global cotton produced which is approximately 6000 metric tones across eleven countries.

According to the 'Organic Exchange Organic Cotton Market Report 2007', global retail sales for organic cotton products in apparel, home and personal care products

increased 85% to $1.1 billion in 2006, up from $583 million in 2005 and was projected to increase 83% to $1.9 billion by 2007. OE projects the market will increase to $3.5 billion in 2008, $4.5 billion in 2009 and $6.8 billion in 2010.

Conventional cotton has an annual harvest of 25 million tones but the annual harvest of organic cotton is only 60,000 tones mainly located in India and Turkey. Long term commitments of brands and retailer are showing a promising future for global market.

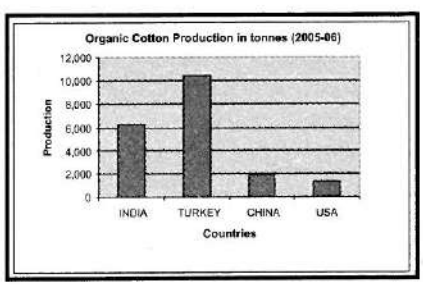


Source: Organic Exchange Report 2007

INDIA'S POTENTIAL IN ORGANIC COTTON

India is expected to overtake Turkey, the current global leader in production of organic cotton during 2006-07. As per the latest organic fiber report for 2006 from Organic Exchange, the California based non profit organization, which is promoting organic cotton acreage and consumption globally, India accounts for 9835 tonnes of organic cotton production which is 31.71% in the world compared to Turkey's 10,160 tonnes which is 32.76% of world's production during 2005-06.

India's organic cotton production in 2004-05 was 6,320 tonnes



Source : Organic Exchange-Fiber Report 2006

which is 25%, below the Turkey's output of 10,460 tonnes which is 41.19%. China and USA are behind for the third and fourth largest supplier of organic cotton with production 1,868 tonnes and 1,336 tonnes respectively in 2005-06. India currently being the second largest producer of organic cotton is expected to emerge as the world's number one producer. India now has 11 active projects in organic cotton. The

largest projects are Pratibha Syntex, Ecofarmsand MaikaalBioRe etc. Among the states producing organic cotton in large quantity are Gujrat, Madhya Pradesh, Maharashtra, TamilNadu, Orissa and Andhra Pradesh. To name a few in this region Vardhaman, Arvind Mills, Ashima & Alok Industries. A lot of fabric sourcing out of Pakistan Mills and garment export is from India. Sapphire Mills from Pakistan is an important producer of organic cotton.

Organic Cotton Markets

India mainly exports to U.K and US. Catering to both small and big buyers. Some of the significant buyers are Wal Mart, Levis, Nike, Gap, Marks Spencer, Reebok, Victoria Secret, Otto, Esprit, Cotton Ginny, Sainsbury, and H & M. The demand is almost 40,000 tonnes presently to rise upto 100,000 tonnes by the end of 2008.

Sale of organic cotton garments is showing signs that even the working class and the middle class would be willing to buy 'green' products. For a brand like Gap the hike in price from a conventional cotton garment to an organic cotton garment is in the range of 20-30% and the cost can be brought down to 15-20% with increase in quantities. If this price difference is maintained then a consumer is ready to pay the price considering the product being organic. This can lead to more consumer usage and not become a premium product.

The textile industry is highly competitive sector and is facing a lot of price cut downs as never before. Most industries today therefore are diversifying their product range in investing in new fibers and organic products to attract more consumers. The challenge to communicate the health and environmental benefits of organic production and processing has become easier as there is lot change in the perception of people in accepting the new concepts and inclination to a better lifestyle. In organic cotton garments the range available is wide and one can choose from 100% niche product to different blends with as low as 5% - 10% organic cotton to include high street and main stream market like supermarkets and mail orders. Thus having a wider consumer base will enhance more export. Organic should not become a marketing gimmick as a lifestyle product for a limited few but provide real value to the consumer making it easily available at the right price and quality to a wider segment of users across the globe.

Ishikawa Fish Bone analysis depicts a clear picture of all the factors which are responsible for making of organic cotton from the fiber stage till the retailing of the garment. Many people think that organic cotton should be much cheaper than conventional chemically drenched cotton. One main reason is that organic cotton does not require expensive GMO seeds, petroleum based fertilizers and the use of expensive toxic herbicides and pesticides that are used on conventional cotton. But, protecting organic cotton from weeds and fighting insects and other pests is much more expensive than conventional methods. Harvesting organic crops are more expensive as well. In conventional cotton chemical methods are used to kill and remove the dry leaves remaining on the cotton as well as the remaining weed. But,

as chemical methods are to be avoided in case of organic cotton, harvesting the crops becomes more labour intensive. Hence the cost of harvesting organic cotton increases.

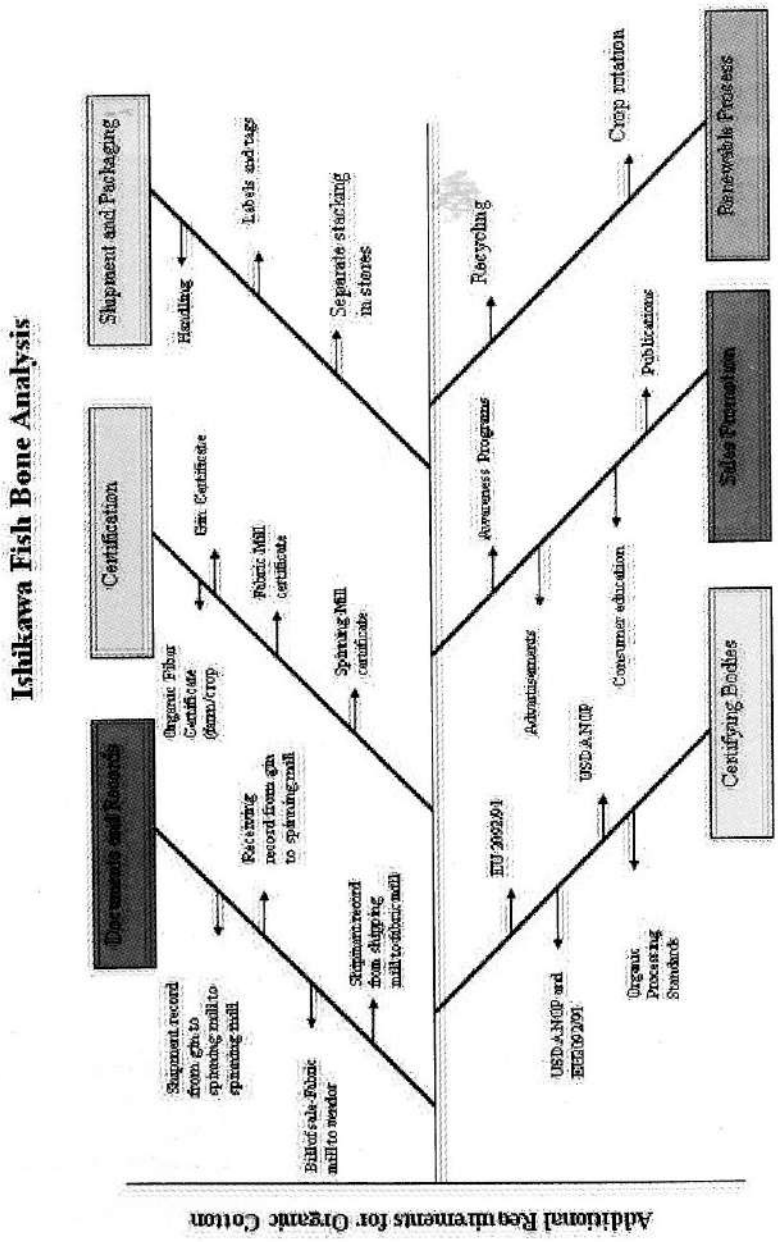
Due to the relatively small size of organic cotton compared to conventional cotton, organic cotton is much more expensive to gin and clean. Most facilities manufacture organic as well as conventional cotton, so every time organic cotton has to be manufactured, the machines have to be cleansed of all conventional cotton fibers. This additional cost is then added to the price of organic cotton. The small market size also adds cost of the organic cotton for the distributors, retailers and the customer. This also increases the cost of advertising. In the end the manufacturers and the retailers lack the buying power to produce and sell organic cotton on a large scale.

Organic garments are more expensive to ship and distribute to retailers and customers because the market size is small and not because it is organic. Same is true for the advertising and marketing cost. It gets expensive for small quantities. Analyzing all the factors which add to the cost of an organic garment it can well be understood that the cost goes up for making of the organic fabric but for the cost going high on the garment manufacturing process is totally avoidable. The manufacturing cost for conventional cotton garment and organic cotton garment should be the same as it is just a matter of planning a smooth hassle free work flow which is related to organizing the production. There is no other factor of material or machinery which is adding to the cost and hence hike in price at the garment manufacturing stage can be totally eliminated. For any change of line there is always a machine down time whether organic or conventional. Proper plan of action will not add cost to this preparatory process for organic cotton. This notion that organic garments are more expensive to manufacture can be controlled.

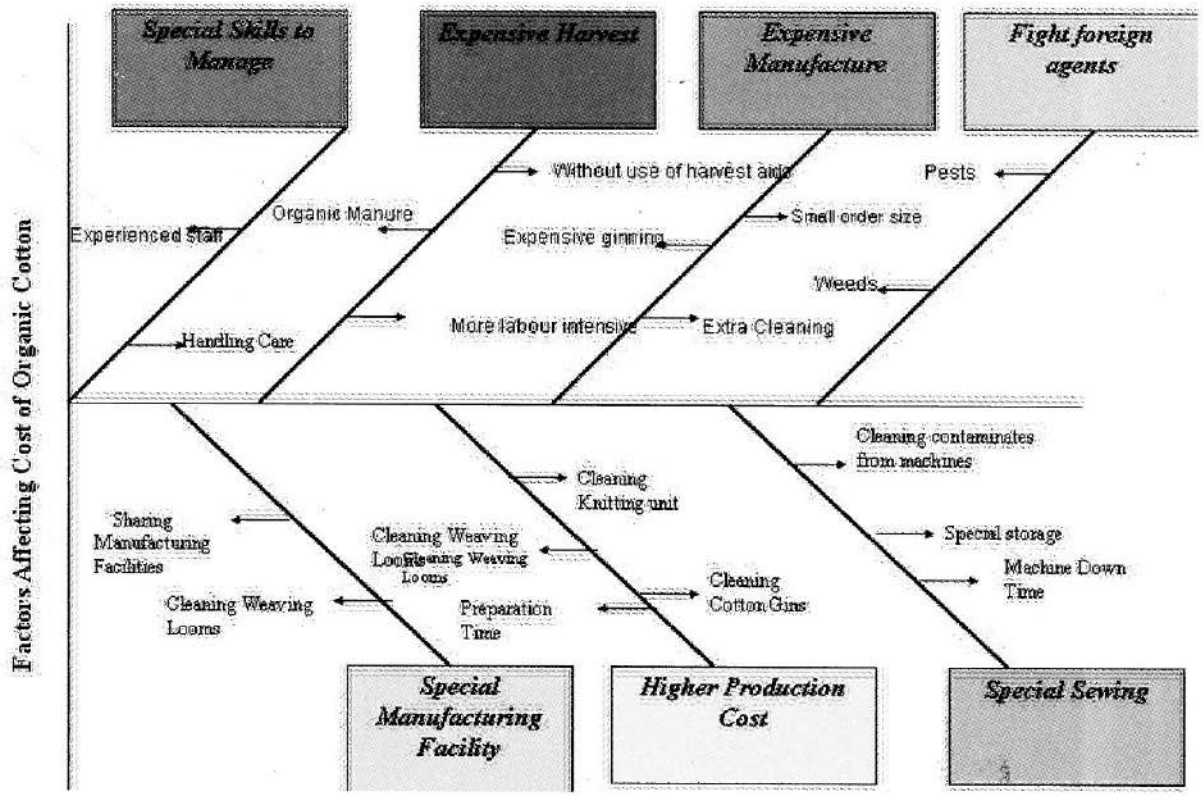
The production of organic cotton faces a number of limitations. There is lack of information on the techniques of growing organic cotton. The crop yield is low because of no use of synthetic fertilizers and pesticides etc... Growers are adopting organic cotton farming on their own because of commercial reasons. Some of the farmers in USA have adopted farming of organic cotton for reduced cost of production, environment safety, health issues and to avoid usage of hazardous chemicals and fertilizers. The average organic cotton yield is 13% less than conventional cotton yield because of various reasons. Conventional cotton uses GMO seeds which show high resistant to pests and insects. Weed management is very crucial for production. The success of production depends on experience and expertise. Forming cooperative societies to develop organic cotton market at a large scale will benefit consumers at all levels and not for the niche market. Education of farmers to understand the benefits of growing organic cotton can motivate them to venture into this area. Strength of this cotton is slightly lower than that of conventional cotton. The staple length of organic cotton fiber is 28mm as compared to 30mm for conventional cotton. Spinning speeds are lower for organic cotton and productivity is 5% lower lesser than regular cotton

Sourcing time for organic cotton is approximately 2 weeks longer as compared to conventional cotton. The price is 25% higher for organic cotton. As compared to conventional cotton it can be dyed with the same dyes with some limitation to the use of chemicals.

An inconvenient truth at the moment is that organic clothing is more expensive than conventional clothing and this significant difference is unjustified.



Ishikawa Fish Bone Analysis



CONSUMER PERSPECTIVE OF ORGANIC COTTON

Consumers' awareness on "environmentally friendly" products has increased. However, the increase in the awareness does not mean that their buying habits have changed. Studies have indicated that factors such as style, comfort and price are still more important to a customer while making purchases. An ideal situation and most "Sustainable "choice would be when products are made to balance out all the factors what a customer looks for and introduce eco-friendly product in a more cost effective manner. Significantly more consumers are concerned about rising prices at retail than the environmental friendly clothing. According to Cotton Incorporated's Lifestyle Monitor, environmental friendliness has remained the least important factor in consumer's apparel purchase decision for over a decade. When purchasing apparel, 87% of consumers consider price to be the most important factor, followed by fabric content, 51% and laundering instructions 50%. Less than 30% considered consider environmental friendliness to be important.

Consumers are also confused sometimes on the over emphasis on "eco friendly "products to be the renewable products or recycled products. Cotton always being the most preferred fiber, customer would readily pay that little extra when labeled as organic and the product can be made available to the mass rather than restricting to a small niche group of consumers. With more effective costing and styling and organic tag for value addition ..... this effort should enhance the export of organic cotton apparel out of India.

CONCLUSION

Expansion of organic cotton farming needs to be encouraged. Suitable measures can be adopted to promote products of organic cotton. Continued growth is expected in all segments of this industry in the next three years. Organic cotton market is huge and doing reasonably well with current limitations. Consumers are demanding corporate responsibility and fair trade practices to be adopted for manufacturing of garments. Consumer is ready to pay premium price for products which social and environment compliance. For the demand to sustain it is important tc make organic products sustainable in the coming future. As of now organic cotton is approximately 0.18% of the overall production (Source USDA). A complete transition from regular to organic cotton would be impossible because of production limitations.

The growth will depend on brands and retailers commitment to consumers by providing right styles, colors, structures and blends. The merchandise in stores is less than 2% of the total merchandise in stores currently. Suppliers and processors of organic cotton are crucial in the supply chain to develop quality and quantity fabric for exports. Farming projects, joint ownership of farmers and supply chain will ensure fair price to the farmers. This will lower the market risk faced by farmers. Increased investments from financial institutes and government bodies can support sustainable organic clothing. A good marketing support from cooperatives and mills can sustain the growth of cotton. Technical advancements will help future

requirements. This will ensure consistency and quality in supply of fiber. Accountability and documentation systems will provide correct data at different levels of production. Today, there are 1200 companies' brands and retailers mushroomed in North America, Europe and Asian Market. Brand and retail demand for organic cotton is projected to increase by 110% in future. Estimated global retail sales of organic cotton products in 2008 was estimated to be 2618 million USD. G rowing demand is now poised to lead a large scale expansion of organic cotton farming around the world.

Encouragement and motivation to growers and producers will make organic cotton products sustainable for future.... The beginning has been made... Sincere efforts from textile and garment industry will take the concept of 'ORGANIC' a long way!!

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"In the long term, Economic Sustainability depends on Ecological Sustainability."

Ms. Sonali Soni Pal
Assistant Professor, Pearl Academy of Fashion

Keywords: Sustainability, Limited Editions, Intelligent choices, fast moving fashion & landfills.

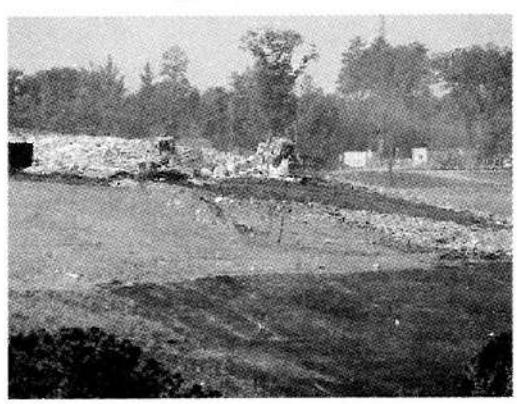
- Recycling creates 6 times as many jobs as land filling. "*Colorado Recycles*"

Change is the hallmark of Fashion, and is impacting on sustainability of raw & finished materials of this industry but also the sustainability of our environment. Sustainable fashion industry will lead our economies to a higher ground involving issues affecting all levels in design, raw materials to manufacturing, distribution to consumer buying.

Design Journeys are bringing together information about lifecycles of fashion and textiles, practical solutions, design ideas and social advances. Innovation challenges the existing concepts about the extent and prospective of sustainability issues in the fast moving industry of fashion and textiles. Focus on sustainable fashion materials sets out a more pluralistic, engaging and forward-looking picture, drawing on ideas of systems, thinking, human needs, local products, fast fashion and participatory design.

The focus of this paper is not on processes involved in making of sustainable fashion but on what happens to these fashion products which do not reach the retail shelves, and thus finally end up as loads of landfills. In simple words, clothes for no one to wear.

A landfill, also known as a dump (and historically as a midden), is a site for the disposal of waste materials by burial and is the oldest form of waste treatment. Historically, landfills have been the most common methods of organized waste disposal and remain so in many places around the world.



Trash is being loaded and compacted in a landfill.

Landfills may include internal waste disposal sites (where a producer of waste carries out their own waste disposal at the place of production) as well as sites used by many producers. Many landfills are also used for other waste management purposes, such as the temporary storage, consolidation and transfer, or processing of waste material (sorting, treatment, or recycling). The purpose of a landfill is to bury the trash in such a way that it will be isolated from groundwater, will be kept dry and will not be in contact with air. Under these conditions, trash will not decompose much. A landfill is not like a compost pile, where the purpose is to bury trash in such a way that it will decompose quickly.

Textile waste can be classified as either pre-consumer or post-consumer. Pre-consumer textile waste consists of by-product materials from the textile, fiber and cotton industries. Each year 750,000 tons of this waste is recycled into new raw materials for the automotive, furniture, mattress, coarse yarn, home furnishings, paper and other industries. Through the efforts of these industries approximately 75 percent of the pre-consumer textile waste that is generated is diverted from landfills and recycled.

The constantly enlarging textile industry often negatively contributes to the environment. A few of the effects of the consistently increasing textile industry are water deficit, climate change, pollution, and fossil fuel and raw material consumption. In addition these effects, today's mechanical textile plants use large amounts of energy, while also producing a throw-away mindset due to trends founded upon fast fashion and cheap clothing.

For example, Macy's is a large clothing retailer; their production often hurts the environment. Despite the common consequences related to the textile industry, Macy's has begun to evaluate their environmental effects to lessen their negative impact by promoting important environmental causes. One way Macy's recently supported the environment was during Earth Week and National Park Week 2008 by raising money with their "Turn over a New Leaf" project. This campaign helps to promote environmental awareness relating to shopping bags and their detrimental effect on the environment.[10] Most plastic shopping bags are made using petroleum, and it takes more than 1000 years to break them down in landfills.[11] Because Macy's uses approximately 43 million shopping bags each year, this can drastically alter the environment. Because of this, all Macy's stores now carry reusable cotton tote bags for sale that sell for $3.95, with one dollar of each sale going toward the National Park Foundation. In addition to the company's bag transition, Macy's is also replacing their synthetic, non biodegradable packing peanuts that accounts for 3.1 million cubic feet (88,000 m^3) of in-box material per year with loose fill material created from corn and potato starch. This new material will break down within 9 minutes with water in the landfills.[12] In addition to these campaigns, Macy's also offered ten to twenty percent off to their customers on Earth Day 2008 in return for a five dollar donation to the National Park Foundation.

Although this helps to raise environmental awareness, some critics are concerned that efforts like this might not be lasting, genuine effects to help the environment, but rather an opportunity for quick advertisement through the press.[13]

Environmental issues arise at all stages of the textile and apparel supply chain.

- The expansion of textile production and consumption has contributed to increasing pollution, water shortages, fossil fuel and raw material depletion, and climate change.
- Production of polyester fibre, the most widely used man-made fibre, consumes non-renewable resources and high energy levels, and generates atmospheric emissions.
- Modern automated textile plants consume large amounts of energy.
- Textile finishing consumes large amounts of water and energy and often produces harmful effluent.
- Apparel production is more environmentally friendly, but sourcing from low cost countries consumes more fuel for transportation.

But as mentioned before the focus here is on what should be done of the extra clothes manufactured every season by all the national and international brands.

Post-consumer textile waste consists of any type of garments or household article, made of some manufactured textile that the owner no longer needs and decides to discard. These articles are discarded either because they are worn out, damaged, outgrown, or have gone out of fashion. They are sometimes given to charities but more typically are disposed of into the trash and end up in municipal landfills.

Among consumers, the trend towards fast fashion and cheaper clothing has led to a throw-away mentality. Although recycling activity remains at a low levelfor economic and quality reasons Marks & Spencer and others are promoting recycling schemes. Shopper's stop and Fab India is a few among the national brands who are following the activity of recycle through exchange offers such as "take new for your old ones".

Brands, companies, corporate, make production projections of styles, colors and sizes depending on the foot fall of a store, festivals, season and other demographics. The focus behind every projection is based on 3 situations:

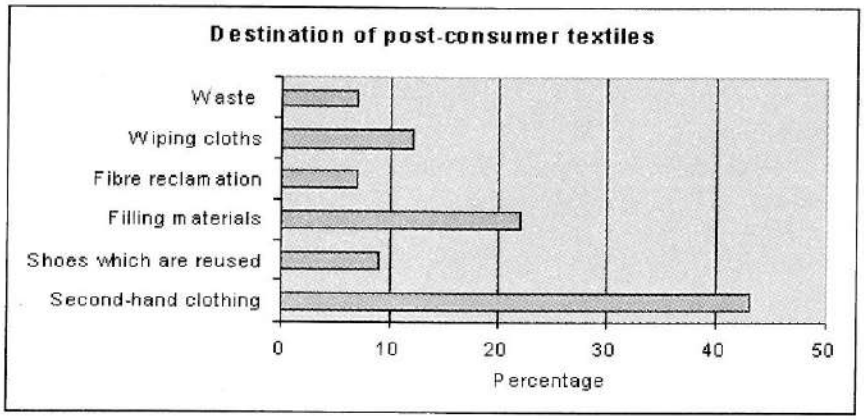
- Money gained that is of course, goods sold at profit
- No money gained where goods are sold at Cost price through sales

And finally the last and least wanted option by all

- Money lost where the goods are sold off at lesser costs to flea markets, or are stocked up in godowns or are just thrown off as dumps.

Three of the top national brands have confirmed that 1% of their annual production of garments does not even reach the retail shelves. All of this 1% is mostly sold off to flea markets, but is never followed up, as to whether all of it has been sold off from flea markets too, or has been further dumped off by these flea retailers. (Names of brands not disclosed due to privacy issues)

Every year, consumers spend more than 1-trillion dollars world-wide on clothing and other textiles. And of course, that much spending creates a huge amount of waste --



cheap, readily disposable clothing that ends up in landfills. As the fashion is fast moving, by the time you have worn your new attires twice the new style is in. Each style by any brand is manufactured in infinity numbers and almost 10% of it does not even hit the shelves of the stores and straight away are dumped to surplus sale markets. Why cant styles be limited editions....

A study in Toronto reported that, on average, about 2 % of all the garbage dumped annually is made up of cast-off clothes. That might not sound like much, but in a city the size of Toronto, that's nearly 20 million kilograms of fashion gone bad. Or, to look at it another way, enough trash to fill 60 Boeing 747 airplanes.

True and dedicated followers of fashion take a lot of time, money and wardrobe space to walk that fine line between cutting edge or complete debacle, and the fashion industry depends on it. But there are always, ways that the industry itself can help to reduce waste, have less impact on the environment and go green. Fashion sustainability is more than recycling; it is about seeking answers for healthy economics. Resources should be used to meet our own needs today while ensuring that enough is left for the future generations.

Consumers need to know how to make informed choices; processes can be changed to reduce waste. Being environment - friendly can also be exceedingly fashionable and sustainable....

We buy to be comfortable, we buy for status, and we buy just to function in our complex society. For most of us in India and other countries, the packaging that holds the merchandise we purchase, and all the old items we've replaced, finally goes to a landfill or a municipal dump, and most of us never even give another thought to the all the waste materials that result from our continuously consuming lifestyles.

Around the world, human garbage either collects in landfills, or it collects in open fields, woods, on the sides of streets, on beaches, in alleys, and along river banks-depending on where it is in the world. The problem is that when trash has been put in a landfill it may be out of sight, but that doesn't mean it's really gone. Many of the

things we throw away will not decompose for centuries, some of it might never do so, and of course the many toxic materials included within our trash will never become any less toxic. So the landfills become bigger and ever more dangerous, and it's only a matter of time until the trash begins to create real problems, or until something is permanently done about it.

As textile recyclers, all the issues being addressed concerning recycling, recyclability, source reduction, etc; have relevance to this diverse industry. It is hoped through education and the cooperation of government agencies that the consuming public will recognize the need and importance of recycling discarded apparel into secondhand clothing. Acceptance of these definitions as part of "recycling" will help encourage the maximum recycling of textile wastes and thus minimize the amount of material that goes into the waste stream.

The proper action would be to call the reprocessing of both pre and post-consumer textile waste "recycling" so that the industry competes by developing new markets and products, not by arguing over definitions. Any textile waste, whether new or old, that is not recycled goes into some landfill.

While the landfills in developed nations are ticking time bombs, in much of the world the problem is immediate, because trash often is just cast out. Most developing countries don't have any organized means of controlling solid waste. Garbage is rarely even collected on a regular basis. Regulations vary from country to country and from town to town, and often a small bribe from an apprehended illegal trash dumper will trump enforcement of official regulations, anyway. Laws are often lax -- burning of garbage and open dumping allowed. Frequently, a lack of funds prevents municipalities in such countries from ever being able to even create a proper waste management system, in the first place. Then, the lack of status and poor salaries associated with the profession discourages qualified employees, so personnel rarely has the ability or the training to manage an effective system, even when one exists. Sooner or later, even the best landfill liners will puncture, leak, and release leachates into the soil, causing soil and groundwater contamination.

We'll Need 2 Planets within 30 Years says WWF, Wednesday, October 29th, 2008

WWF, the global conservation organization, has just released the 2008 version of

their Living Planet Report and things are not looking good for planet Earth - or those of us who live here.

The report is recognized as probably the most authoritative report on the state of the world's ecosystems. According to the report, our global footprint now exceeds the world's capacity to regenerate by about 30 per cent. This has increased from 25% in the 2006 report. Furthermore, our global footprint is expected to keep increasing unless we do something about it. The report says that if our demands on the planet continue at the same rate, by the mid - 2030s we will need the equivalent of two planets to maintain our lifestyles.

The 2008 report draws comparisons between the world economic crisis and the "world ecological crisis". It says: The recent downturn in the global economy is a stark reminder of the consequences of living beyond our means. Whether we live on the edge of the forest or in the heart of the city, our livelihoods and indeed our lives depend on the services provided by the Earth's natural systems.

The report continues to say that we are consuming the resources that underpin those services much too fast faster than they can be replenished.

Just as reckless spending is causing recession, so reckless consumption is depleting the world's natural capital to a point where we are endangering our future prosperity.
Though the Good News is ...

Despite the apparent gloom and doom, there is a light at the end of the tunnel.

WWF believes that it's not too late for us to do something about the looming "ecological credit crunch". Success requires that we manage resources on nature's terms and at nature's scale. It also means that we must find ways to manage across our own boundaries across property lines and political borders to take care of the ecosystem as a whole

It is hoped that the waste industry accept this definition of post-consumer textile waste as no longer clothing, but in fact a raw product, which is termed "mixed rags." From these raw mixed rags, a new product--secondhand clothing--is created. It is important to note that new and secondhand clothing differ markedly in their respective sources, purposes, and markets. Work in producing secondhand clothing encompasses the spirit and the letter of the recycling effort, avoiding by-products in a labor-intensive industrial setting in the creation of new and necessary products.

Including both pre and post-consumer waste in your proposed definition of "recycled material" and recognition that the recycling of mixed rags into secondhand clothing is a valid form of recycling will be an important step in reaching this mutually desired goal.

What WE Can Do:

- Take your used clothes to a textile bank. Contact the recycling officer in your local authority if there are no banks in your area and ask why; they may collect textiles through other means. Alternatively you can take used clothing to local charity

shops. Another way of looking at it is not recycling but up-cycling.

- Give old clothes/shoes/curtains/handbags etc. to jumble sales. Remember to tie shoes together: part of the 6% of textiles which is wastage for merchants are single shoes.
- Buy second-hand clothes - you can often pick up unusual period pieces! If bought from a charity shop, it will also benefit a charity.
- Buy things you are likely to wear a long time - a dedicated follower of fashion can also be a green one if items are chosen carefully.
- Look for recycled content in the garments you buy. This should be on the label, though at present there is no conventional marking scheme and some companies do not always advertise the recycled content.

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Sustainable retail & commercial spaces in NCR, India

Anjuna Dhirr

ABSTRACT

Sustainable development refers to that growth, which meets the needs of present society without compromising the needs of the future generation and minimal ecological effect

Sustainability issues and concerns on planet Earth's health have begun attracting a lot of attention. This itself is the incentive that businesses need in order to consider it as an option, if viable.

India, being in the centre of Economic boom, infrastructure assumes a critical importance and NCR is seeing a lot of construction of Retail and commercial spaces. Shopping Malls are now a part and parcel of the Indian retail environment. As product developers and local & national retailers in many areas are working to develop sustainability policies and better greener products, the focus is starting to shift to the places the products are sold. So we have instances of greener retail outlets, but more as an individual experiment than an industry practice.

Historically, the retail development industry has been better known for its tendency to lay down acres of concrete, in place of the farm land that existed, than for efforts to produce sustainable projects. The Malls are often owned and operated by a development/management company. Mall developers handle the day to day operations in the facility as well as marketing and branding for their Malls.

This study concentrates on possibility and viability of factoring ecological issues into the planning, development and marketing of the Malls and retail spaces in NCR region

Key Words: Sustainable retail, strategies, Malls, NCR

1. INTRODUCTION

1.1 The concept of sustainable development

Sustainable development is development which meets the needs of the present without compromising the ability of future generation to meet their own needs." (WCED, 1987)

Sustainable development also requires meeting the basic needs of all people and extending opportunities for economic and social advancement. Finally, the term also implies the capacity of development projects to endure organizationally and financially. A development initiative is considered sustainable if, in addition to protecting the environment and creating opportunity, it is able to carry out activities and generate its own financial resources after donor contributions have run out."

A sustainable system delivers services without exhausting resources. It uses all resources efficiently both in environmental and economic sense.

1.2 The concept of Green building

The real Estate and construction industry in India is one of the rapidly growing sectors which contributes significantly to the nation's economy. This sector now contributes to 10% of India's GDP. Adding to this, worldwide, buildings are the biggest consumers of all the resources and also biggest pollutants, with a very large carbon footprint(Pivo,2008)

So, a green building naturally adds on to the environmental factors to be looked into on a priority basis.

A green approach to the built environment involves a holistic approach to the design of buildings. All the resources that go into a building, be they materials, fuels or the contribution of the users need to be considered if a sustainable design is to be produced. Constructing a green building requires resolution of contradictory issues and requirements. Every decision has financial and environmental implications.

A "green" building places a high priority on health, environmental and resource conservation performance over its life-cycle. These new priorities expand and complement the classical building design concerns: economy, utility, durability, and delight. Green design emphasizes a number of new environmental, resource and occupant health concerns: These buildings try and

- Reduce human exposure to noxious materials.
- Utilize renewable energy resources and conserve scarce materials.
- Minimize life-cycle ecological impact of energy and materials used.
- Use sustainable material.
- Protect and restore local air, water, soils, flora and fauna.

1.3 Emphasis on LOHAS

Lifestyles of Health & Sustainability (LOHAS) has today become a significant movement to be able to carve a separate niche for itself . LOHAS in Indian context extends to building and construction industry with ;

- Home certification by LEED, Top Ten or other rating system
- Energy star appliances certifying energy efficiency

- Sustainable flooring with alternative re-usable material &
- Renewable energy systems

LOHAS has considerable value since it's a complete lifestyle and the practitioners would apply this in all sectors of life, preferring to buy green products from green stores at green buildings. Additionally it has tremendous noise generating, politically correct footprint, making it an important consideration.(Kapoor, 2008)

2. METHODOLOGY

2.1 The study adopted primarily literature survey method to find the specific issues related to adoption of sustainability practices in Commercial Green buildings across the world. The study also attempted looking at real life case studies for coming to conclusions

2.2 The study was carried out with the following objectives;

2.2.1 Mapping the challenges and practices to the making of green commercial buildings.
2.2.2 To look at factors which go into making a building environmentally friendly and sustainable
2.2.3 To map the applicability of the greening factors to the Indian Retail spaces , in NCR region.

2.3 The study is primarily exploratory in nature and uses extensive literature
survey and observation method. The literature study further established the need for conducting the study further by case study method, followed by a focus group discussion with some expert builders from NCR, Delhi.

3. THE STUDY

3.1 The reality about Indian Reality

Taking action on India's environmental crisis is no longer an option, it's a necessity, says a recent research report titled 'Sustainable real estate Development in India' by Jones Lang La Salle Meghraj, India.

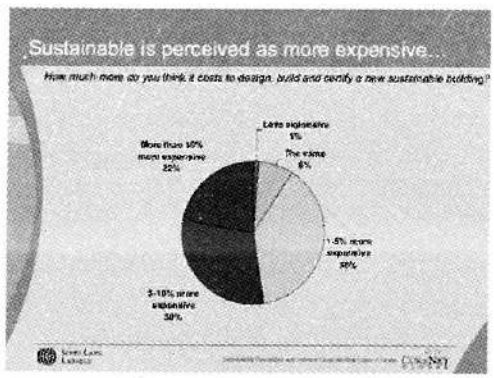
There is an increasing level of interest and awareness about environmental friendliness and sustainable building practices.

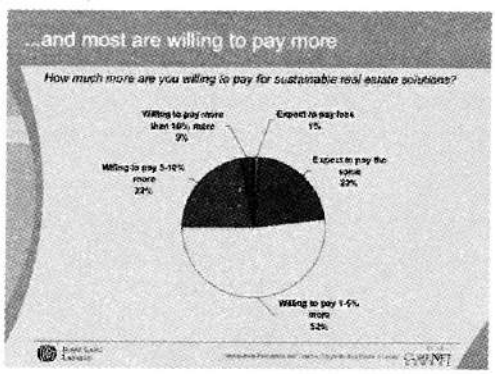
An earlier research By Jones Lang Le Salle establishes that;

3.1.1 Awareness of need for Sustainability in real estate and construction industry is increasing

3.1.2 Sustainable is perceived as more expensive

3.1.3 Though most people are willing to pay more for sustainability





(Jones Lang Ls Salle, Coronet, 2007)

With the above understanding of demand, there is now a lot of interest in builders and other construction industry professionals to get into sustainable buildings.

3.2 The Regulating and certifying bodies in India

Confederation of Indian Industry, CII plays a very important role in promoting sustainability in the Indian construction industry, with it helping the 'Indian Green Building Council'(IGBC) gain a foothold in the construction sector. The IGBC has licensed the ' Leadership in Energy and Environmental Design', (LEED) Green Building Standard from US green Building Council and is currently responsible for certifying 'LEED- New Construction' and 'LEED- 'Core & Shell Buildings' in India(Kapoor,2008)

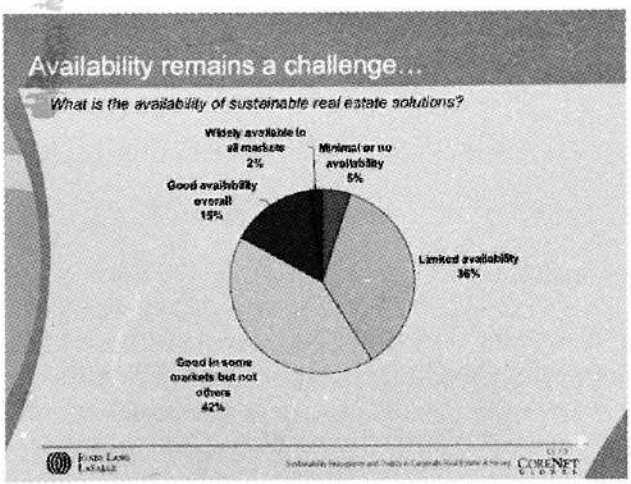
Till date, the following five buildings have only received a LEED rating in India;

3.2.1 CII- Sohrabji Godrej Green Business Centre, Hyderabad
3.2.2 ITC Green Centre, Gurgaon
3.2.3 NEG Micon India Pvt. Ltd.
3.2.4 Wipro Technologies, Gurgaon
3.2.5 Grundfos Pumps, Chennai

Retail Industry has different guidelines which take into consideration the unique needs of the industry. LEED for Retail-NC encompasses new and newly renovated standalone buildings while the LEED for Retail-CI classification allows tenants of shopping centers, malls or other adjoined space to certify a face-lift or build-out of their retail space..

While office buildings have long-term employees, fairly consistent water usage, and office-specific lighting, the energy and resource use in retail spaces are typically irregular: Customer traffic and water use varies, and some spaces, such as restaurants and grocers, often use refrigeration or other high-energy equipment. In particular, the lighting needs of retailvastly different from officesare critical for business.

Almost 40 construction projects currently underway are registered with LEED for certification, which is emerging as a preferred rating system because of its flexibility and ease of application across various industries. Almost half of these are retail establishments



(Jones Lang Ls Salle, Coronet, 2007)

3.3 The Sustainability factors

As per a study conducted by Vulcan & The UEI (The Urban Environmental Institute, Seattle, USA), Sustainability in the construction and building sector necessarily involves the following considerations;

3.3.1 Future proofing the buildings
3.3.2 Designing of the whole building environment and making it all sustainable
3.3.3 Follow the sustainability principal of concentrating on the core factors.
3.3.4 Always maintaining the sustainability standards
3.3.5 Creating and sustaining the green brand

Application of these to the commercial building industry, broadly translate into ;

3.3.6 Being Environmentally smart. This would also mean going against the established concepts of aesthetics , beauty and comfort, though balancing it with the owner/ user's sensibilities is important, because a building not liked , will never be maintained well. A Retail place by its profile, has to be attractive to the final customer.

3.3.7 Doing things as per the Landscape and site's demand , with an emphasis on being lean , green, frugal and minimalist. The risk could be managed by future proofing, creating buildings which are adaptable to different uses and greening to the maximum possible. Using landscape for multiple functions, to treat storm water, to create animal habitat, to reduce heat islands and to cool the local microclimate in summer.

3.3.8 Proper water management to optimize utilization of water resources.
Steps like eliminating the use of potable water for toilet flushing or irrigating plants along with efforts to make top layer over soil pervious to allow water to percolate , recharging ground water.

3.3.9 Eliminating the concept of waste in an effort to use minimum resources, using only local material and creating healthy non-toxic buildings. It is surprising to find that good green buildings often cost little or no more to build than conventional designs. Commitment to better performance, close teamwork throughout the design process, openness to new approaches, and information on how these are best applied are more important than a large construction budget.

3.3.10 Energy management is another important issue.
Since buildings have a large energy consumption profile it becomes important that the energy is resourced from the renewable resources and the consumption is controlled to the maximum extent possible. Solar Photo Voltaic cells are the most accepted and tried form of sustainable resource for energy generation, whereas daylight designing and building orientation (as per the sun direction) are becoming part of the consideration set.

3.3.11 Cost benefit
Whatever be the bouquet of sustainable practices decided for a commercial building, retail outlet or Mall, it has to be cost effective. According to a study, most green buildings are high-quality buildings; they last longer, cost less to operate and maintain, and provide greater occupant satisfaction than standard developments.

So the investment also needs a different perspective. The investors need to re-look at return on investment on a longer term basis, on factors of future proofing of the building, on its marketability and its affect on ecology and environment.

3.4 Sustainability & NCR

Builders today are beginning to see economic value in a LEED rating. It is coming to be seen as a prerequisite for Class A commercial space, hence can override the traditional fixation of first cost.

1. Being Environmentally active. To a large extent, this has escaped the attention of builders because it has been purely a race for the best, the most visible, the highest and the fastest to encash upon the retail and real estate boom. It has been more important to look good than to be good. Conscious, deliberate efforts to future proofing have not been undertaken .

2. Land, building and conservation. Most Indian buildings have architects as consulting experts, but 'Vastu' considerations also feature high on the building or outlet planners list. So the orientation, and daylighting aspects are definitely considered. A few buildings have taken concrete steps to water re-cycling and rain water harvesting, though creation of animal habitat and heat islands shall be seen only in distant future. Solar energy cells and photo voltaic cells are definitely visible, but have not been adopted on a large scale. Rest of the steps are still at a very basic stage of awareness and implementation.

3. Since a commercial building has different stakeholders and decision makers, often there is a difference of opinion and clash of (financial) interest between the owners an users.

Though these differences exist, there is nothing which proper information education , outlook and long term perspective cannot resolve. According to Mr. Suresh Anand from HL Linkers, " its time that the owners & users begin looking alongside each other , to issues that matter- (environment) and the long term effect of all their actions.

A crucial understanding which has resulted from a study is that, most green buildings are high-quality buildings; they last longer, cost less to operate and maintain, and provide greater occupant satisfaction than standard developments.
These buildings also have the added advantage of sounding so 'correct' that sophisticated buyers and lessor would prefer them over conventional buildings and be willing to pay a premium for their advantages.

4. CASES

The making of a Green building is a conscious strategic effort requiring concurrence of all the stakeholders . This is adequately reflected in the cases considered below.

4.1 Case of Vancouver waterfront;

This is case of a project under construction on the Vancouver waterfront, Canada. The program calls for 1 million sq ft, enclosed , and 9 acres of open space. Included are an exhibit hall, a ballroom, meeting rooms, retail, and parking. To be built on a former industrial site, the project has to eliminate or seal in much contamination. It's required to provide an extension for a shoreline park and preserve view corridors to the harbor along major streets. An exhibit hall will extend over much of the site, with a layer of parking, and above these will be public open space and a planted roof some of it accessible, all of it seen from nearby high-rises. The roof is also folded and slotted so that its greenery can be viewed from the interior below.
Sea water will be used for cooling. The roof guttering system will make some areas wetter than others, and plants will be allowed to migrate and adjust to moister and light, yielding distribution patterns that reflect conditions. Irrigation for planted areas needed only occasionally in summer will be drawn from the black-water treatment system. Tidal growth will be restored to the water's edge.

In making the building respond to circumstances, the architect said, the design team "had to force themselves not to tweak forms just to please themselves." To him, making strong architecture is inseparable from making sustainable architecture. The list of collaborating professionals on the job runs to about 50 people.

The project is likely to earn LEED Gold. That goal emerged only late in the project's design, but didn't change what the team had done.

4.2 Case study of the Genzyme Center in Cambridge, MA

The Gemzyme Center was one of the first important green building and developer, Hines, was allowed only three weeks to develop a concept.

The schedule was three years to move-in date. The 345,000-sq-ft structure stands on a constricted brownfield site. The program called for building to the sidewalk line for a district being transformed from industrial to urban mixed use and suitability for single-tenant occupancy. The building necessarily became essentially a cube, but its distinction is in what happens within that cubic volume. The interior is conceived as a city, say the architects. The ground floor is all an indoor plaza, with retail and water features. Corporate occupancy starts on the mezzanine. Seventeen gardens are distributed throughout the structure as spaces for meeting and informal gathering.

The strong green agenda included giving individuals control over their workspace environment and giving all of them ample daylight.

The central atrium acts as both a generous daylight shaft and a return air chamber. Angled mirrors and prismatic louvers above the roof enhance the daylighting, Chandelier-like mobiles hanging in the atrium move slowly with the return air, casting reflections and rainbows. Overall, the workspaces are 80 percent daylighted.

Some portions of the façade are double-walled, with walkable spaces between the two glazing layers. Some are not, depending on orientation and occupancy. The distinctions enliven the exterior.

The building as a whole reportedly seems more European than American, with its strong focus on occupant comfort. But, say the architects, the occupants must learn how to inhabit a green building (to manage thermal systems and windows, to dress appropriately), and the building must be adaptable to future changes in functions and technologies.

The system includes forced ventilation, with no additional cooling, much of thetime.

Daylighting was calculated to add $3 million to building cost, but it was retained as essential to the building's concept. Reflective blinds and reflective ceilings direct light deep into workspace.

The concrete framing provides thermal mass, which plays a vital role in the system by moderating temperature swings. On the brownfield site, however, it was essential to drive the fewest possible piles and not to overly complicate the vapor barrier that seals in underground contamination.

4.3 The retail sector in the U.S. has been slow to adopt sustainable building practices for a variety of reasons . These reasons include a desire to construct quickly (allowing little time to design the building) and the uncertainty of how nontraditional building envelopes and systems will affect sales. Retailers have significant experience in controlling lighting levels and other environmental elements to ensure that stores remain profitable. Due to the risk of reduced profits, most retailers are reluctant to incorporate solar features, including daylighting and passive techniques, into the building design.
A remarkably different approach was taken in the design of the BigHorn Center in Silverthorne, Colorado. One of the retailer's primary goals was to minimize the environmental impact of the new building. As a result, the design team applied the whole-building design approach and successfully integrated solar and energy efficient technologies into the building design (Torcellini, Hayter & Judkoff 1999).

From the beginning, a design goal for the BigHorn Center was to create a sustainable retail environment. Even before the complex was completed, the owner attributed increased sales in his existing facility to the publicity received for his efforts towards sustainable design of the BigHorn Center.

The building was built in three phases. The Phase I building design includes a super-insulated envelope, daylighting, advanced lighting technologies, and other energy-efficient features. The Phase II building was completed in March 1999 and contains two home improvement specialty stores. In addition to the energy-efficient envelope and systems similar to the Phase I design, Phase II includes a 2-kW building-integrated photovoltaic (PV) system. This grid-tied PV system laminated onto standing-seam metal roof panels was installed to offset building electrical loads. Phase III, completed in April 2000, houses a hardware store with an associated building materials warehouse . Other strategies included optimized envelope features, radiant slab heating, and optimized building controls.
Phase 111 incorporates the most aggressive sustainable design strategies of the three

phases. Improvements based on lessons learned in Phases I and II are part of the Phase III design. These strategies include daylighting, advanced lighting technologies, natural ventilation cooling, transpired solar collector, building-integrated PV, improved envelope features, and integrated controls.

The BigHorn Center is one of the first examples in the U.S. of integrated daylighting and natural ventilation cooling systems in a retail space. The BigHorn Center is the first commercial building in the State of Colorado to have standing-seam metal roof-integrated PV systems. The Phase III PV system is the largest building-integrated PV system in Colorado

5. CONCLUSIONS

Builders in NCR region, Delhi India definitely have become aware of the sustainability drive happening across the world and understand its importance for them and their businesses. But the knowledge is minimal and the urgency and the practical aspects of the same escape them.

They welcomed the suggestions and feel that they provide useful indications to going green in minimal invasive manner, but also feel that it may not be possible to implement all the suggestions any time soon.

It will have to be a combination of information, education, long term perspective and intense regulation which will see some appreciable difference in the way we construct and use our buildings and retail spaces .

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Garry Pivo- Building responsible property portfolios at www.unepfo.org

Limited Resources for Unlimited Ideas...

Ambika Magotra, Pearl Academy of Fashion, New Delhi

As the fashion industry continues to produce new styles and trends at a frantic pace. This is having a negative effect on the environment as the resources are being used faster than they can be produced. The challenge of this century including fashion industry is to inspire, engage, and connect people to sustainable world.

The study conducted on semester 1, PG Diploma course in fashion design students focuses on learning design process and becoming aware of what benefits of recycling the discarded material is on various sustainable fashion approaches. The learning outcomes of the assignment were to be judged on developing design solutions to problems of sustainability.

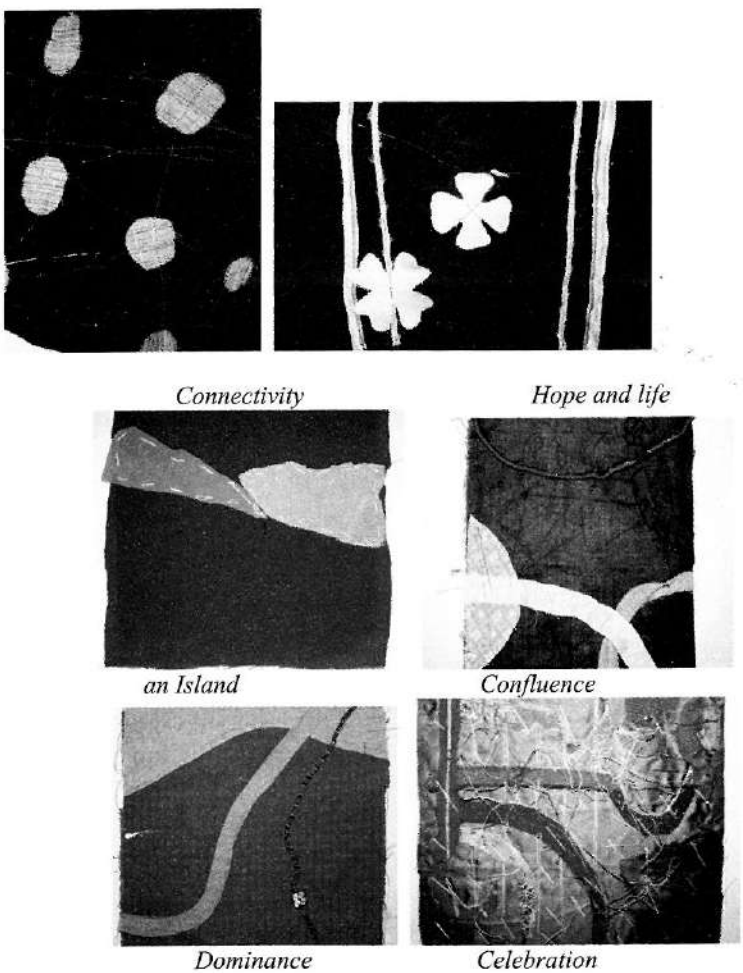
The concept was commenced by encouraging and attracting students with assignments to recycle, reuse and rethink to reduce excessive depletion of natural resources.

An assignment was given to explore line compositions on paper, later to interpret the best compositions in waste fabric .With this the innovative journey started to make use of limited resources for attempting new design initiatives, evolving design vision of their own, commitment and passion to create safe and cyclic sustainable design. The students explored innovative ideas, which helped them to evolve individuality and a conscious style in their efforts.

Students were made to feel pride by informing others how and what part of their creation is recycled. Initially there were some inhibitions in going out sourcing materials to be recycled; It is normally considered a taboo to reuse the discarded material for the purpose of producing a new range. Gradually they inculcated the fondness for sourcing recycled materials.

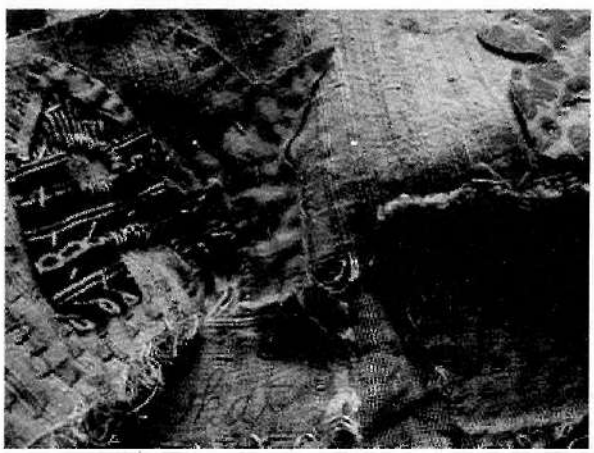
Some students had a natural talent for good designs and colour choices, while others struggled to understand the principles and elements of design and constantly worked to acquire aesthetics in compositions and colours to gain confidence in the creative process. Initially they explored techniques like mind mapping ,2d line compositions and pattern using normal running stitch, back stitch and kantha stiches, which were used to stimulate creativity. The students were encouraged to collect raw materials, which were available in their surrounding areas for better understanding of basic design concept and process. Visual Representation of their ideas displayed students understanding about the clarity in their theme.

This exposure of playing with recycling fabric swatches motivated them to experiment, explore and express their originality in compositions. Students with ease could use elements of designs and explore creativity.



Compositions explored using waste fabrics

They were made to value and appreciate the fact that concept of recycling has been an integral part of Indian cultural heritage. Kantha, the Bengali textile craft, done by recycling worn out muslins, which women instead of throwing them away, piled them in layers and stitched. The layered cloth was held together by various stitches. The cloth had multiple uses and its execution had nature friendly approach. It is a typical example of how a simple stitch can create elaborate motifs.



Kantha variations from traditional to contemporary

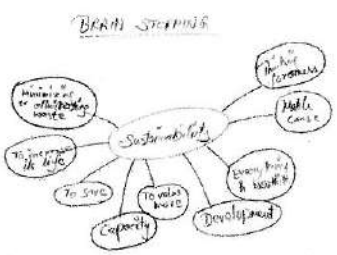
The benefit of recycling of an old material can be felt in the form of less use of natural resources and thereby curbing the impact on the environment. The test of creativity in designers' lies in how best they can utilize the left over materials in churning out new fashionable product for which demand among buyers can be created.

In present era of global warming recycling of clothes can help in meeting the challenge of safeguarding the environment. The reliance of a dsigner on the use of obsolete material can also contribute in preserving the natural resources.

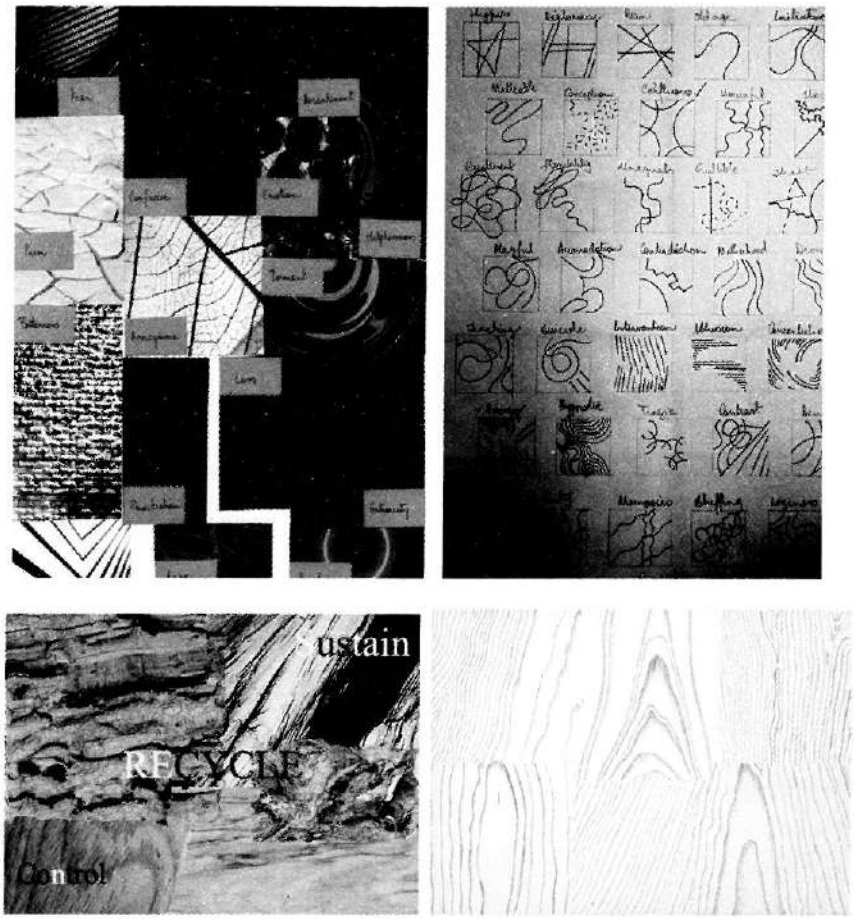
In the urbanized area the design students have an inherent inhibition to make use of discarded material. They feel that recycling of such old materials may be a shameful act, as this would reflect their economic status, which may not be liked by elite section of buyers. Where as in the rural areas, the artists have no such inhibitions. While using the old materials, they inadvertently produce new creations .This may project India's rich cultural heritage in tuned to with the existing global fashion trends in the fashion Industry. They are not discouraged by their economic conditions in recycling the old product.

Once the inhibition amongst design students was broken by making various line compositions and later interpreting these compositions using waste fabrics compositions , they felt emboldened to make use of old material for evolving new fashion concepts. The frugality of designers' sometimes has impelling impact for generation of new fashion designers. At times scarcity of resources drives an artist to evolve innovative design, which gives birth to creative designs which may set a new trend in the fashion world.

Students researched to get sensitized to the theme and wrote concept note. After this explorations for their themes for the upcoming project started.A survey was conducted to find out the habit of recycling old material among the students. In this regard the project brief assigned to the students was to develop a range of sustainable garments. After completion of the project, the survey was assessed to know their performance in reusing and recycling aged fabrics.



Brainstorming of the theme sustainability



Mood boards with theme Sustainability, line explorations based on themes

Understanding the degree of the problem may be hard to grasp, though a visit to Cloth mandi made everything clear. A group of students visited a mandi, where discarded clothes are sold. Students got exposed to the fact that practice of recycling the old and worn out materials such as garments, bed spreads or any kind of discarded textile and trims is not new to Indian society.

Shri .Baba Ramdevji Gujrati Samaj, old clothes vendors' place

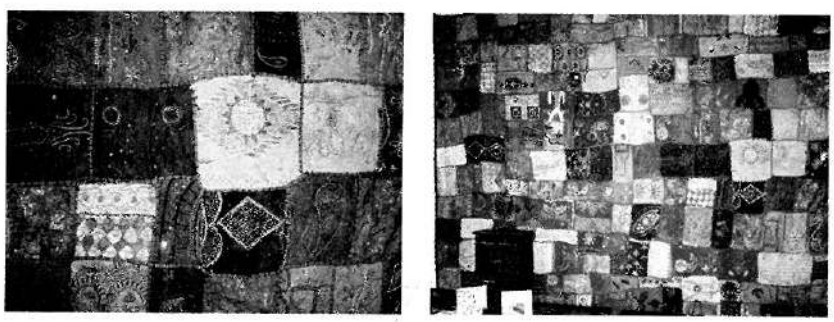
Collection of old clothes which is taken to the mandi for re-selling

A market where unwanted garments, textiles and trims are sorted and sold.

People who can't afford to wear new expensive clothes make utmost use of old clothes. They give new look in accordance with existing styles of clothes, which may not only help them to save money but also make them look smart and causing little or no damage to the environment and therefore able to continue for longtime.

Old Shirts and old jeans are washed and re dyed for the purpose of reusing

Many items are in excellent condition and it is not clear why they have been rejected. The main aim of the research is to look at the role that the designer can play in creating textiles that have a reduced impact on the environment and to provide a toolbox of designer-centered solutions.

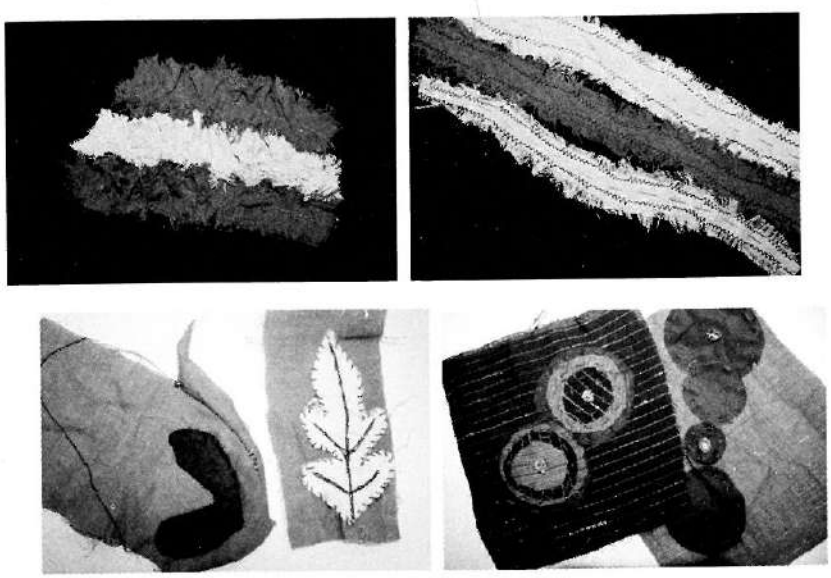


Above piece created form borders of oid saris and discarded garment and pieces of cloth, which is transformed into bed spreads or table linens and many gift items are also made which is already an unusual and unique piece of textile art.

After the students were ready to face the challenge of using thrown away clothes, which was to be extended to fashion, by putting new life into rejected clothes
A questionnaire relating to sustainability as design ideology was circulated among them to obtain first hand information on sustainable approach towards fashion design. The feedback of students was encouraging in the sense they exhibited their susceptibility and openness to imbibe the habit of recycling. I did underline that making clothes more sustainable is not in itself enough as a selling point. Nor is it enough to change the industry. They will have to make garments that people would want to buy.

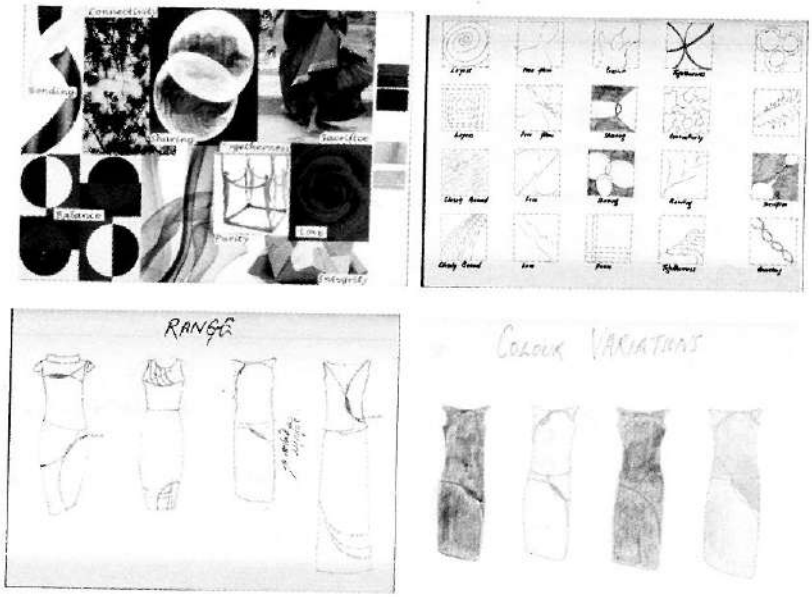
This also revealed sensitivity of students towards eco- fashion and a developed inclination towards their own concept of sustainability. They thoroughly enjoyed the assignment and predicted how such explorations would create 12 fashion seasons in a row than two fashion seasons. This fundamental shift also meant fashion maintenance would cost less to buy something new than to get it dry-cleaned or repaired.

Based on these excursion and collecting aged and discarded fabrics class began their texture explorations needed for fashion range development project.



Textures explored for the final design using all discarded fabrics

While the materials they could adapt to their designs dictated their styles, many tried to find the closest fabric weight in cottons - they argued, discussed, which forced them to be inventive.



Theme Sustaining harmony, line explorations, range development sheet

Students gave a serious thought process what all they could do with such exciting available resource. After getting convinced with the fact *'if the next time you think of throwing out those old clothes, think instead of how you could recycle that material into crafts or fashion or even gifts. You will be saving the environment and your wallet at the same time.'* Designers just need to take responsibility and most importantly need to **innovate within limitations** that would keep pollution, deforestation, species loss, and global warming all under control.

a range done in discarded denims and an old skirt converted into wearable top

The survey was also helpful in knowing the thought process of students towards sustaining peace, harmony, motivation, nature, heritage etc.taken as sub themes. The zeal to recapture recyclability as fashion statement was very well displayed in putting it completely.
Students were forced to put pressure on their cognitive faculties to overcome the challenge of producing unlimited designs out of limited resources. "The enjoyable aspect instigating positive change in the industry," felt by students is Introducing an alternative to fast fashion.

Students were interactive and worked with all possible details to accomplish creative and useful end product

It's no longer enough that a product is pretty on the outside, cheap and available. We owe it to the coming generations who will have to clean up our products in the future to manufacture in harmony with nature. Students finally constructed the garments keeping client in mind .It displayed good evidence of their concern about sustainability . We have to reveal all these hidden environmental and social impacts and create products that have a "total beauty". These products, also known as 'sustainable products', are those that are the best for people, profits and the planet.

The survey also manifested their multifaceted understanding of issues related to the eco-friendly use of resources for designing fashion ensemble. Their perception of concern of environment was also reflected in their understanding of eco-fashion through the use if old, discarded, and obsolete material. The latent idea in their approach is to protect the earth planet from scathful impact of global warming and degradation for the fulfillment of broader objective of protecting earth planet from global warming and its obnoxious impact...sensitizing young minds to create and give better future through fashion design.

'SUSTAINABILITY IN THE TEXTILE FASHION INDUSTRY CHAIN: CROP TO SHOP'

A study on local & global perspective of Indian Jute Industry

Anirudh Prasad Singh

Introduction:

Jute has surely risen to become an important fiber because of its user-friendly features like high tensile strength, biologically degradable, resistant to heat and above all environment friendly nature. It has grown to become known world over as a secondary industrial friendly material with wide range of applications like Packaging, weaving, Floor covering, cables, explosives, upholstery, apparels.

The size of Indian Jute industry is estimated to be a whopping 1.5 million metric tonnes and India is the second biggest exporter, worth of around US $180 million. Jute is approximately cultivated in 1007 thousand hectares with a production of nearly 10133 thousand bales and provides employment to over 4 million farmers and 0.2 million factory workers.

The jute sector has been playing an important role in the economy of the country in general and the eastern region in particular. Apart from contribution to the national exchequer from exports and through taxes and levies, the jute industry provides sizeable employment in farms and industries. About four million families, most of them small and marginal, are engaged in the cultivation of jute and mesta and about two lakh workers are employed in the jute industry.

There are 73 jute mills in the country, of which 59 mills are situated in West Bengal, 3 each in Bihar and UP, 4 in Andhra Pradesh and 1 each in Assam, Orissa, Tripura and MP. At the end of October, 2000 the total number of looms installed in the industry stood at 43,989 and installed spindles at 552,420 for fine yarn and 84,848 for coarse yarn.

Today Jute is experiencing a transformation in its conventional applications. Earlier what initially began as a fabric for packaging has grown to emerge into a multifaceted fabric.

Its strength and natural texture has lent it a functional and decorative value that has prompted it to be widely used apart from its conventional packaging purposes. Today it also finds wide acceptance world over as an effective material for home décor too.

The present generation of designers have successfully used Jute to make the interiors more vivacious. It finds extensive application as cushion covers, furnishings for the sofas, table mats etc. The beauty of the jute mats, dhurries and carpets lies unparalleled, considering the vibrant colours and designs that can be contrived on them. Attractive Jute wall hangings made with the effective interplay of

fibre and yarn on a jute canvas can be said to be at par with any oil and canvas painting. Infact, the dimension derieved on them makes these Jute wall hangings all the more appealing.

With the whole world growing environmental friendly Jute has grown to become a fashion statement. It is a joy to be seen around with. Infact its range of personal accessories like garments, foot wear, designer bags have all emerged to take the heart of art lovers by storm

Processes of forming finished jute

The jute plant is an annual plant that thrives best in moist soil in a hot, humid climate. Seeds are hand-sown, and plants mature in three months, often averaging a height of **10 to 12 feet** (3 to 3.6 meters). Their light green leaves are arrow-shaped, and small yellow flowers bloom singly or in clusters. Jute is classified scientifically in the genus Corchorus.

Washing Process

The plants are harvested when the blossoms first begin to shed. The cut stalks are sorted according to length and gathered into bundles. They are then placed in shallow pools of stagnant water where they are allowed to ret, or ferment. When they have become soft enough, the fibers are separated from the stalks and then hung on lines to dry. After drying, the fibers are sorted, graded, and baled for export.

Drying of raw jute

Burlap, low-grade twine, and many other products are made from jute. Because it is low-priced and adaptable, jute is
second only to cotton in world consumption of natural fibers. India, China, and Bangladesh are the leading producers.

Bales of raw jute

In the environment conscious world today, the Golden Fibre has proved to be immensely popular. It is biodegradable and therefore environment friendly; so the products merge with the soil after sustained use. In turn, it enriches the soil with organic substance and helps to grow better crops. On combustion, its fumes are non- toxic and produce no residue. **JRP (Jute Reinforced Plastic)** is widely used to pack tea and fruits especially for its excellent 'breathing qualities'. It effectively packs garments, cement, fertilizers and other products as well. Geo-jute has been developed to control erosion on mountain slopes, canal banks and railway sidings. It also helps vegetation to grow - naturally. Jute has also proved to be the ideal replacement of wood.

The Indian jute sector, comprising the organized jute industry and a large number of decentralized/cottage units, has now reached the stage of producing materials, which are not only durable, but also attractive from the esthetic sense. Numerous end-uses have been found for the golden fibre to meet the requirements of the connoisseurs.

Processing

The array of products now being manufactured from jute are endless. From fine silk, finished fabrics, versatile furnishings to intricately designed oriental carpets - jute makes them all.

Moulded furniture, Wall Hangings, Swing Chairs, Flower Pot Holders, Tea Coasters, Mats, Blankets, Slippers, Shopping Bags, Bead Curtains, Dolls, Soft Luggage, Briefcases, Skirts, Jackets, Lamp Shades, Floor Runners, Panels, Boards and a whole lot more. Inexpensive & Aesthetic. The products are ideal for homes, offices, and public places.

Thus, it could be rightly concluded that, in the years to come Jute will rightly emerge as the Golden Fabric, which it is fondly termed as.

Finished Product

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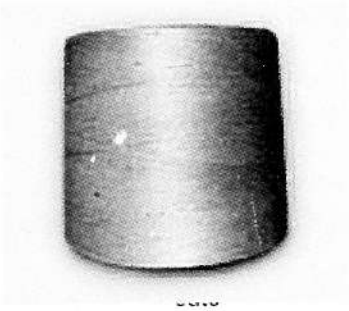
Jute products

Jute yarn is available from 4 lbs. to 48 lbs in single or multiple twists. Meeting the quality requirement of customers need. Winding in cylindrical / conical / coneless spools or hanks as per requirement.

For usage in carpet industry, cable industry and for multiple other usage. Also available in bleached dyed and blended jute yarn in different colours and compositions.

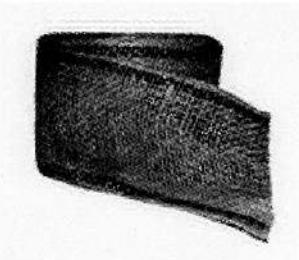


Jute twine has and still is traditionally being used for hessian bag repairs, sewing and tying. Polished Jute Twine is still used by Post Offices worldwide.

Jute garden twines, preferred by Agriculturists and Horticulturists, are available in green or natural. All jute twines are packaged according to customer requirements.

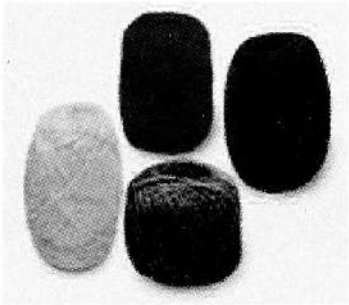
Jute Tubes : Spirally sewn, tailor - made for the construction industry & other applications.

Jute Webbing : A narrow weave tape made of jute using single or plied jute yarn having width of not more than 6".
Uses : For the Cable industry. As binding tapes for the carpets.

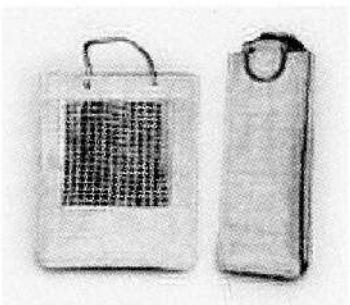


Jute Ropes : Made from natural jute mainly used for tying purposes available in length,Spools and according to customers requirement.

Jute Balls : Made from Jute twine in the form of balls and mainly used by stichers , weavers for different purposes in textile industries. Can be used for tying purposes too.



Jute Bags : Shopping bags, Wine bags with different kinds of handles for fancy purposes.
Used in shopping as well as gifts and novelties too.

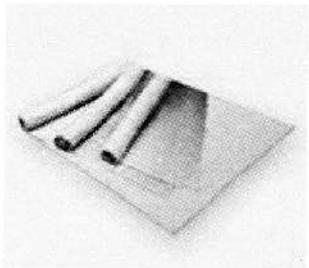


Sacking Bags includes Sacking Clothes & Bags - A. Twill, B. Twill, D.W Flour, Heavy Cees, Sugar Twill etc. (also wool pack variety from sacking cloth). We are one of the biggest manufacturer of this product, manufacturing under IJIRA Licensing Certificate.

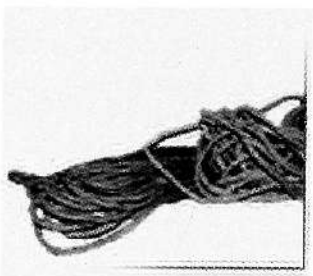
In size and weight as per customers requirement. The products are available in both Hessian and Sacking. Specially used for packing Coffee, Cocoa, Peanuts, Shellnuts, Hazelnuts etc.

Hessian : A plain weave cloth made wholly of Jute with single warp and weft interwoven weighing not more than 576 grms/m2. All types of standard and non-standard Hessian Cloth from 4 Oz to 14 Oz in weight. Width upto 200 c.m.,

construction as per customer specification, and requirements.
Uses : For making bags or as a cover to pack the material.



Rubber Coated Jute Twine & Yarn : Natural Jute Twine coated with rubber used for tying of trees and branches against storms/winds and preffered by the gardeners and agriculturists.



Research Methodology

The rational behind the topic selection was the challenging aspect of this industry which is not very much diversified and burgeoning at present. The industry has more growth potential in future taken into consideration the strengths and opportunities of this sector. As this industry is giving huge millege to the economic condition of the country,the study would help us to understand the Indian Jute Industry in better perspective.

Objective:

- .To find out the market of jute products in India and abroad and how the products would be sold in the Global markets.
- . To impart a revolutionary and evolutionary change in the Indian jute industry in terms of better technology, creativity and innovation.
- .To make the massive awareness of jute products in the minds of consumers causing replacement of plastic in bags, textiles in apparels,palets curtains etc.
- .To boost Indian agriculture through globalising these products

Statistical Techniques :

- **Random Sampling**
  - **Survey through questionnaire**
  - Various export houses ,handicrafts and handloom organizations in jute products in Delhi
  - **Survey through personal interactions**

- **Sampling Size**

Export Houses and handloom organizations=10

Schemes of National Centre for Jute Diversification, Ministry of Textiles(NCJD),Government of India

The activities of NCJD Include

- Dissemination of technologies on jute diversification
- Extending technical guidance and training for setting up jute diversified product manufacturing units
- Organizing skill development programs aimed towards capacity building
- Nurturing the small ,medium,cottage level units in the decentralized sector and NGOS
- Organising quality orientation,design development and awareness programs to enhance market acceptability of jute diversified products
- Lending support services to the entrepreneurs and NGOS for implementation Of their project
- Providing financial assistance(capital subsidy) for seting up production units for jute diversified products
- Engaging specialists and specialized institutions for demonstration and dissemination of technology,design and product development
- Making available raw material like fibre,yarn and fabric at distant locations and in required small quantity
- Providing market exposure and creating linkages with buyers to facilitate sale diversified products
- Setting the environ for furtherance of jute to newer areas of need etc.

To carry out its mandate NCJD operates the following schemes.These schemes are promotional in natute and are fully funded by the governmet of India.

1. JUTE SERVICE CENTRE SCHEME
2. JUTE RAW MATERIALS BANK SCHEME
3. MARKET SUPPORT SCHEME
4. DESIGN DEVELOPMENT SCHEME
5. JUTE ENTREPRENUERS ASSISTANCE SCHEME

❖ **JUTE SERVICE CENTRE SCHEME(JSC)**

Accoding to *JUTE SERVICE CENTRE SCHEME(JSC),NCJD*

Jute service Centre Scheme aims at extending technical support,marketing advice,design promotion,maintenance of date bank and assistance to enreprenuers,NGOs,craftsperson,weavers,artisans,selfhelp groups,clusters and individuals engaged to be in jute related activities.Jute Service Centres are collaborative partners of NCJD operating at distant locations to implement activities a the field level

Major Functions of Jute Service Centres are:

- Holding awareness workshops fro promotion of jute related activities and jute diversified products.
- Organising technical demonstrations of manufacturing processes fro various diversified jute products.
- Conducting /participating in local exhibitions and provide exhibitions space to entrepreneurs/NGOS in such exhibitions at a nominal cost.
- Maintaing technical information,resourse availability data
- Carrying out design development based on local genius and document for dissemination
- Providing information to prospective buyers and to organize buyer seller meet
- Build linkages with govt and other agencies
- Monitor NCJDassisted projects

❖ **Jute Raw materials bank Scheme**

Accoding to *Jute Raw Materials Bank Scheme.NCJD::*

Jute Raw materials Bank Scheme aims to make available jute fibres,fibrec and yarn in small quantities as required by the micro enterprises,craft-persons and artisans at their areas at reasonable prices.Though this scheme sale outlets are set up at distant locations around the country in collaboration with bonafide bodies and attempts to maintain a uniform and affordable price for jute yarn through these outlets.

❖ **Market Support Scheme(MSS)**

Accoding to *Market Support Scheme(MSS) .NCJD::*

Market Support Scheme aims at facilitating small entrepreneurs and NGOs to have exposure to market through participants in exhibitions and stall at various emporia.The Scheme also arranges purchase by marketing agensies like state marketing federations emporia etc.Mass market products are being promoted through the exhibitions and participation in fairs at various locations around the country.

Under usual circumstances NCJD is obiliged to extend priority to NCJD assisted units i.e those which have been financially assisted to set up training cum productions units.Those individuals which have been assisted otherwise are next in priority ,followed by other organizations which are having innovative products and have good production back up to supply goods if demand arises.

❖ **DESIGN DEVELOPMENT SCHEME(DDS)**

According to ***Design Development Scheme(DDS),NCJD::***

The Design Development Scheme aims at keeping beneficiaries abreast with the time and trend so that the product of the assisted entrepreneur is maintained market worthy. This is an in going process,which NCJD has been carrying on with the involvement ofspecialized institutions,expert individuals and local genius where available ,with a view

to add value and enrich every product from time to time,to cater to consumer taste and preferences.
The scheme further aims to improvise handicraft,decorative and woven products made by small and micro level entrepreneurs and production units in the decentralized sector,in order to make it acceptable to the ever changing market.Similarly efforts are also directed to improvise on the local ethnic products of remote regions to make useful and attractive without in anyway infringing on its ethnicity.

Based on survey reports of NCJD's service centers and response of respective regions design development is carried out either through design workshops or by way of holding hands on design training programmes.These activities are organized by engaged specialist designers for training entrepreneurs.These are held at locations convient to the beneficiaries.This enables generation of newer ideas for creativity and value addition.Design development is also organized by engaging freelance designers and attaching each to one production unit for a specified period.

This scheme provides additional thrust to product development and design innovation.A design bank is being established at the center.This Scheme envisages documentation and dissemination of designs,cataloguing them and also organizing design workshops especially fro the small entrepreneurs and theNGO's sector.In this effort NCJD has entered into a collaboration with NIFT .Also included are prototype development and design catalogue for all time reference.

❖ **Jute Entreprenuer Assistance (Capital Subsidy) Scheme**

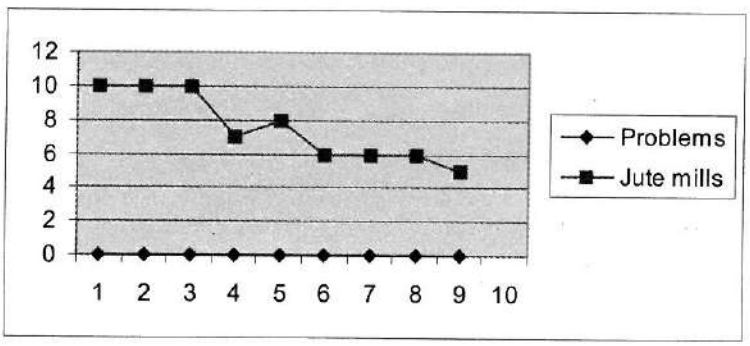
According to ***Jute Entreprenuer Assistance (Capital Subsidy) Scheme NCJD::***

Jute Entreprenuer Assistance Scheme was introduced by the national jutde development
Programme to transfer the benefits of various R &D and test marketing efforts putin by a number of institutions under the programme of entrepreunuers to promote value added biodegradable jute diversified products has shown encouraging results in increasing demand for jute fibres in different grades which in turn ensures remunerative price to the jute growing farmers and help the traditional jute industrty as well as the new class od entrepreneurs find new end uses and markets for ecofriendly renewable agricultural resourse-jute.Continuation of this Scheme of providing incentives to entrepreneurs will help in furthering the demand for jute in the coming years

Questionnaire Analysis

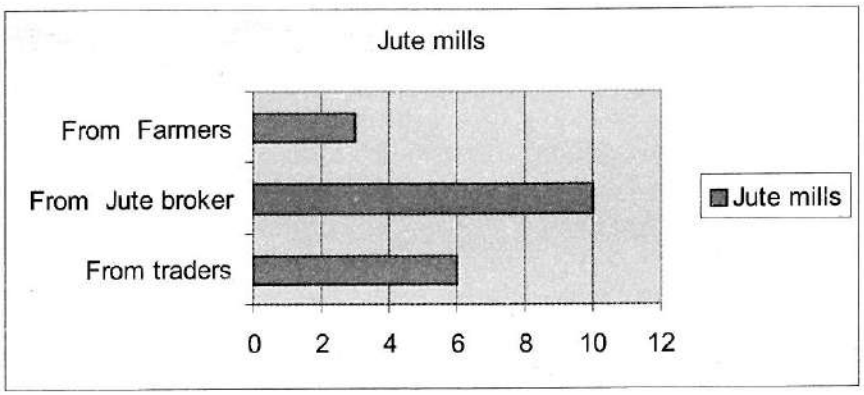
□ Problems faced by jute industry

Problems	No	Jute mills
Labour Problem	1	10
Unfavourable weather	2	10
Fluctuating Price	3	10
Heavy Inventory	4	7
Government Policy	5	8
Low cost products from other nation	6	6
Poor demand	7	6
Low quality	8	6
Low technology	9	5



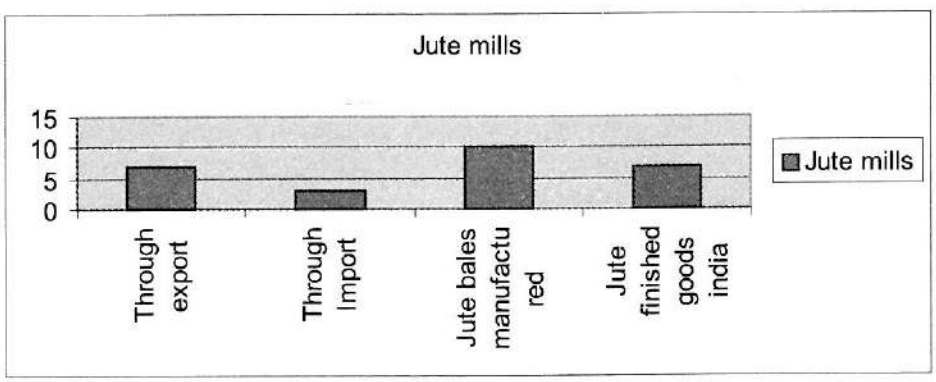
Analysis: From the chart and diagram all jute mills considered labour problems,unfavourable weather and fluctuating price are the main problems for them .They considered changes in govt policy too considered on on the reason of cause of problem.As per mill owners poor demand,poor quality ,high competitions are the primary problems zone for jute mills.

Trading in india	Jute mills
From traders	6
From Jute broker	10
From Farmers	3



Analysis: From the diagram it shows that mostly trading in India is done via jute broker.60% trading is done between jute mills and local traders directly and very less trade with farmers

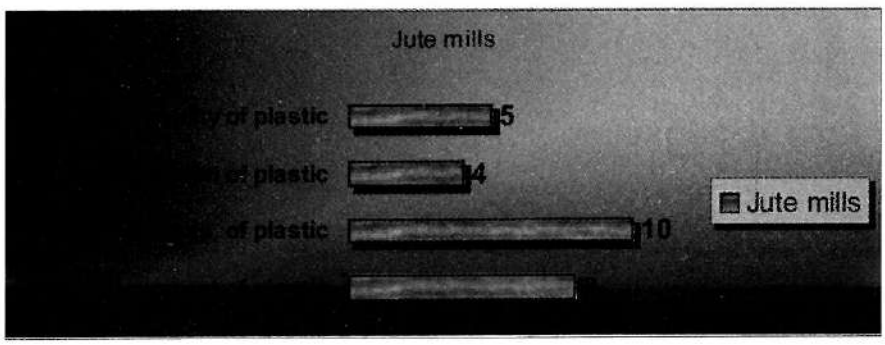
Trading finished goods	Jute mills
Through export	7
Through Import	3
Jute bales manufactured	10
Jute finished goods india	7



Analysis: According to the diagram all jute mills trade jute bales and 70% of jute mills trade through exports and domestic trading of jute goods in India respectively. Import of jute goods are done by 30% jute mills

- **Threats for jute mills from plastics,cotton**

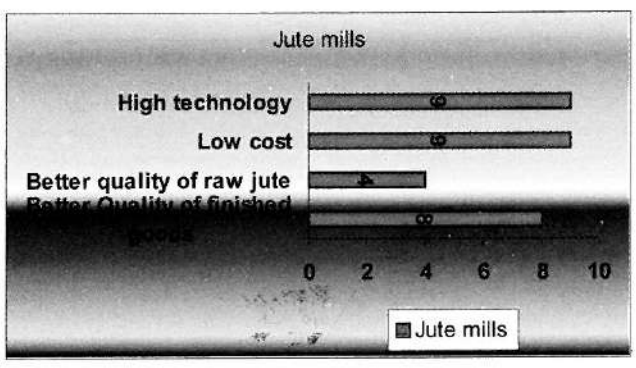
Threats from plastic ,cotton,	Jute mills
Low cost of plastic	8
High awareness of plastic,cotton	10
High production of plastic,cotton	4
Good quality of plastic,cotton	5



Analysis: The diagram shows that all jute mills are considering high awareness of plastic as major success too incomparison to jute..Very few said that high production of plastic,cotton will put hingrances to the jute mills

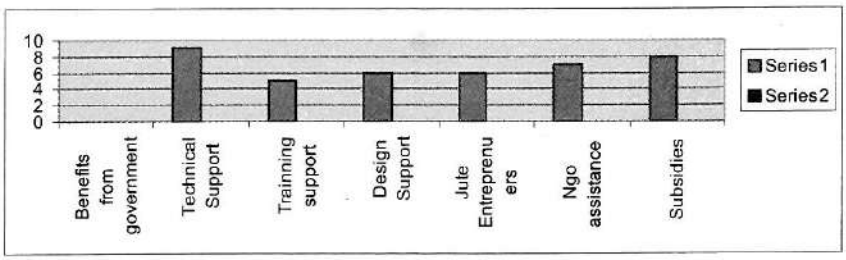
- **Threats from foreign countries**

Threats from foreign countries	Jute mills
Better Quality of finished goods	8
Better quality of raw jute	4
Low cost	9
High technology	9



Analysis: The diagram shows that mostly all jute mills are considering high technology and low cost are the considered a threat to indian jute mills form foreign competitors.

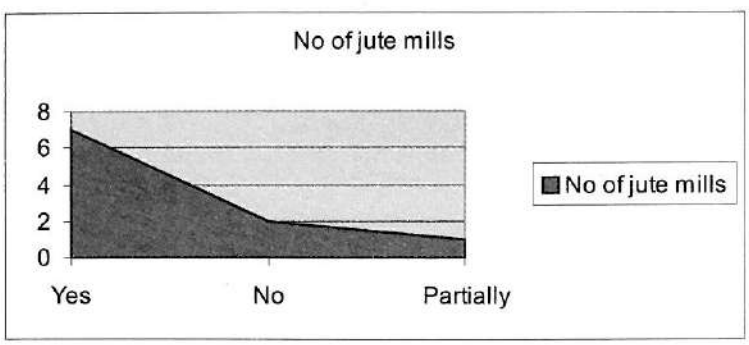
Benefits from government	Jute mills
Technical Support	9
Trainning support	5
Design Support	6
Jute Entreprenuers	6
Ngo assistance	7
Subsidies	8



Analysis: The diagram shows that government is providing technical help much to the jute mills which is on of the big incentives jute mills are getting.They also considered subsidies as great form of incentives to the Indian jute Industry. Government trainning facilities still lack in helping jute industry.

- **Globalisation of jute products**

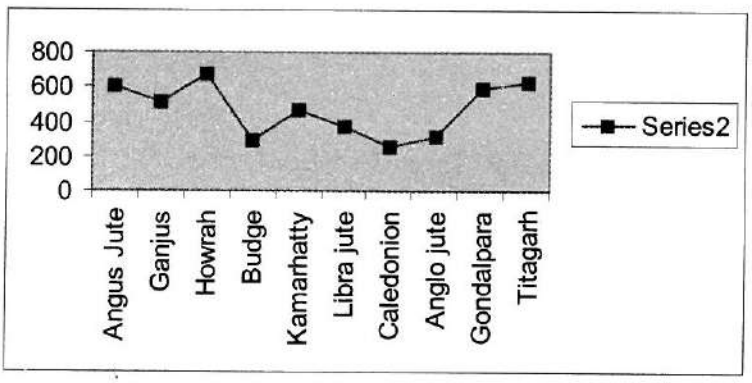
Globalisation of jute	No of jute mills
Yes	7
No	2
Partially	1



Analysis: The figure above shows that all jute mills are positive that there are chances that jute industry and jute products would be globalised.Very few said it is hard to be globalised

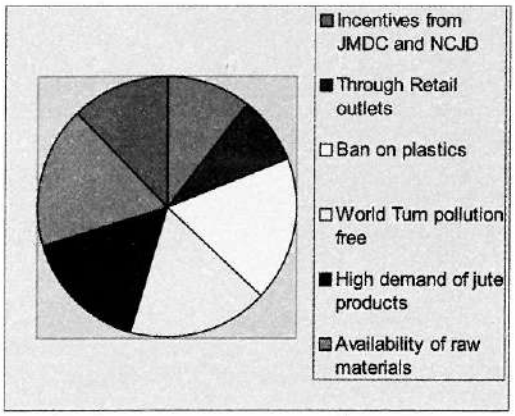
- **No of employees worked under jute mills**

	No. of employess
Angus Jute mills	600
Ganjus Jute mills	507
Howrah Jute mills	670
Budge budge jute Mills	288
Kamarhatty Jute mills	460
Libra jute mills	370
Caledonion jute mills	259
Anglo jute mills	311
Gondalpara jute mills	590
Titagarh jute mills	631



Analysis: The figure shows that around 400 emloyess are there in jute mills on average .This sector is the opportunistic employment zone for the the Indian people

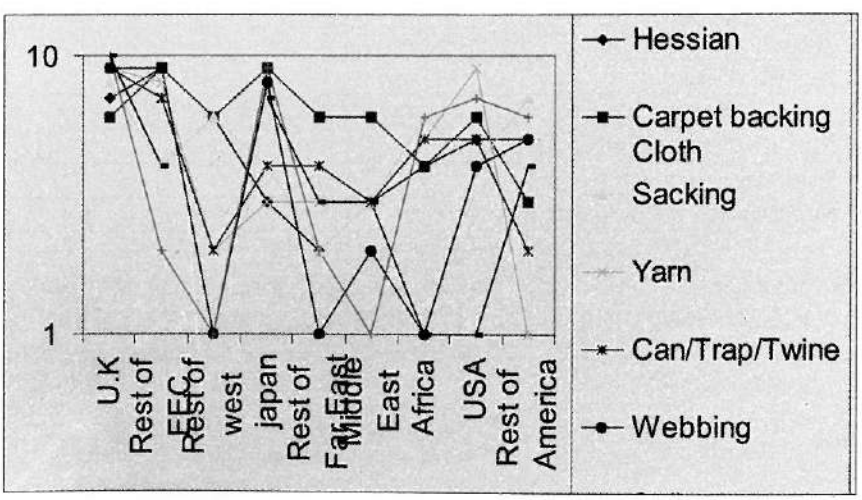
Opportunity	No. of Exporters
Incentives from JMDC and NCJD	6
Through Retail outlets	5
Ban on plastics	10
World Turn pollution free	10
High demand of jute products	9
Availability of raw materials	10
Subsidies by government on export	7



Analysis: The figure shows that availability of good quality raw jute,,ban on plastics and moving approach of world towards pollution free could give benefits to them in future.Subsidies by government could also play major role.

- **Countries where they sell the products most**

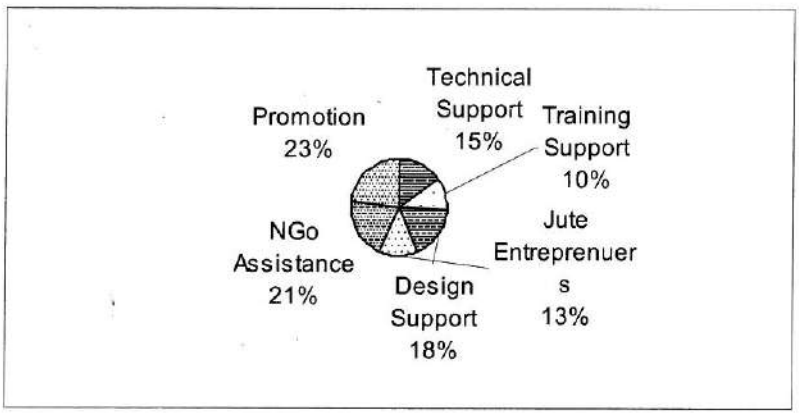
Jute goods	U.K	Rest of EEC	Rest of west Europe	japan	Rest of Far East	Middle East	Africa	US A	Rest of America
Hessian	7	9	6	3	2	3	4	5	5
Carpet backing Cloth	6	9	6	9	6	6	4	6	3
Sacking	8	4	6	4	2	3	6	4	7
Yarn	9	8	2	3	3	3	5	9	1
Can/Trap/Twine	9	7	2	4	4	3	5	5	2
Webbing	9	9	1	8	1	2	1	4	5
Soil saver	10	2	1	9	2	1	6	7	6
Décor Fabrics	10	4		7	3	3	1	1	4



Analysis: **The above figure shows that most of the jute goods are exported to japan,Rest of EEC ,rest of west and middle east and u.k. Nowadays in Africa,cuba,brazil ,argentina and other countries are the upcoming export are for Indian jute mills**

- Support from Government

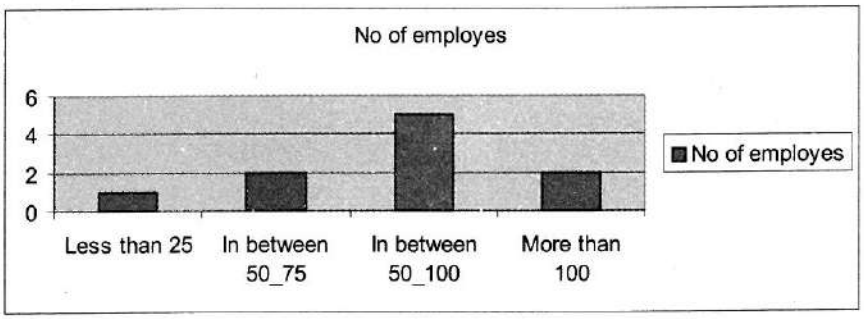
	No.Of Exporters/handloom insititutions
Technical Support	6
Training Support	4
Design Support	7
Jute Entreprenuers	5
NGo Assistance	8
Promotion	9



Analysis: The figure shows that government is helping them in the promotions of jute through NCJD.As per them govt should come forward to promote it fullflegedly.Only few said that trainnng by govt provide much help. The figure shows that exporters are not that much benefited by government

- **No.Of employes worked under export houses for jute products**

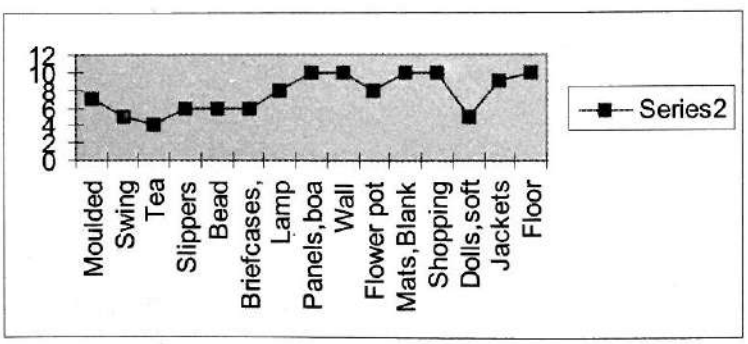
	No of employes
Less than 25	1
Less than 50	2
In between 50_75	5
More than 100	2



Analysis: In around 10% export houses have employess less than 25 and half said that they have employess in between 50 and 75.

➢ **Demand of jute Products**

Jute Finished goods	No of Exporters
Moulded Furniture	7
Swing Chairs	5
Tea Toasters	4
Slippers	6
Bead curtains	6
Briefcases,Skirts	6
Lamp shades	8
Panels,boards	10
Wall hangings	10
Flower pot Holders	8
Mats,Blankets	10
Shopping Bags	10
Dolls,soft Luggage	5
Jackets	9
Floor Runners	10

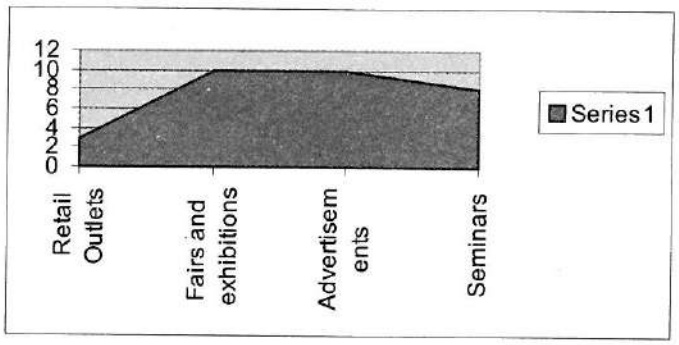


Analysis: The above figure shows that there is more of demand abroad of

lampshades,mats,blankets,shopping bags ,jackets etc.It shows that demand of jute is vey much abroad.

➢ Promotion Strategy

Promotion Channel	No of Exporters
Retail Outlets	3
Fairs and exhibitions	10
Advertisements	10
Seminars	8



Analysis: The above diagram shows that fairs and exhibitions and huge advertisement through journals,television and other magazine will give huge promotional benefits to the industry.

Swot Analysis Of Jute Industry

Strengths

- User friendly features
- High tensile strength,
- Biological degradable
- Resistant to heat
- Environment friendly
- Industrial friendly material with wide range of applications like packaging(like jute reinforced Plastic, JRP) weaving floor covering, cables(GEO JUTE) etc explosives, upholstery(GOLDEN FIBRE) ,apparels
- India largest producer of jute
- Provides employment to 4 million farmers and 0.2 million factory workers
- Important role in the economy of the country and eastern region

Weaknessess

- Unawareness of jute products to masses
  - High cost in making jute products manually compared to plastics product,leather products
  - Labour union problems in jute industry hampers its growth
  - High price fluctuations in the price of raw materials
  - Weather condition unfavourable
  - Seasonal growing
  - Huge inventories cost

Opportunities

- Incentives by Jute Manufactures Developnment Council(JMDC)
  - Incentives by National Centre for jute Diversifications(NCJD)
  - Technical support
  - Training Suport
  - Design Support
  - Design Inputs
  - Jute Entreprenuers Assistance
  - NGO Assistance
  - Selling of Jute diversified products through retail Products
  - Ban on Plastics increases its(jute) global awareness
  - India the largest producer and second largest exporting Countries
  - Whole World turns to pollution free
  - High demand of jute materials in fashion apparels,upholstery, bags etc

Threats

- From Substitutes products like plastic, leather, propylene ,cotton etc
  - From other jute producing countries like Bangladesh,China ,Philipins,Nigeria,Nepal
  - Low cost of raw jute and finished products importing from Bangladesh,china
  - From unfavourable weather conditions

PEST ANALYSIS

- ***Political Factors***

  - Government Policy
  - Political Turbulence in state and central Government
  - Political Ties up with Industries

These political factors help the jute industry in creating strife less environment in the industry. Government policy help in creating subsidies for doing business in India and abroad. The government policy decides the mood of the farmers,traders,industrialists of jute industry.It fixes the import duties in importing

raw jute and finished goods taking into consideration of local traders,farmers,jute mills . The government policy decides the wages of the jute workers,incentives etc.

- ***Economic Factors***

  - GDP of the country
  - Demand of jute in abroad and India and supply of jute (demand supply factor)
  - Economic condition of Farmers,traders,Jute industries
  - Export and import duties,
  - Competitions from china,Bangladesh ,philiphins etc and internal competions
  - More dependence of jobs on jute industry

Economic factors help in deciding the demand and supply of jute products in India and abroad by deciding the price of the raw jute and finished goods.At present price of raw jute is highly fluctuating due to ups and downs of the businesses in all the sectors. Price of jute is also decided by the quality of raw jute(TD2,TD3,TD4,TD5,TD6,TD7) and its production..In places like coochbehar,dinhata,Mathabanga,Alipur,Siliguri etc price of jute is high in comparison to prices of jute in U.P and Bihar Region like Murligang,Sharsa,purnia,Kathiyar etc.

- ***Technology Factors***

  - Adaptation of new technology
  - Use of automation in producing jute goods
  - Use of various new chemicals and other materials in jute to make it more tenstile,
  - Communication with traders,industries,farmers etc

New Technologies help producing better products like Geo Jute,golden jute etc.Due to implementation of technology the companies are reengineered their production procedure with efficient ERP,LRP(logistics Resource Planning) and Communicatin with traders,stockist,farmers, and jute mills.The new chemicals which are formed because of amalgamation of various chemicals give more tensile strength to jute products.

- ***Societal Factors***

  - Impact of jute on society(like pollution free)
  - Upcoming fashion World,
  - Taste of people

The Impact of jute is very conducive to the society.It gives no pollution on being burnt. Jute gives fashionable products to the society like apparels,bags,moulded furniture,swing chairs,teacoaster,slippers,bead curtains,briefcase skirt,lampshade, wall hanging, mats etc.Jute is the very lucrative and flamboyant product to the fashion industry

Major Problems faced by Indian Jute Industry

According to West Bengal Consultancy Organisation LTD(KolKotta)

"The jute industry is crying hoarse about the cut in mandatory packaging orders. However, for the time being, there is hardly any shortage of orders for traditional sackings"

According to industry sources, the Union Government has already proposed to buy 8.37 lakh bales of 50-kg jute bags weighing 655 grams. Moreover, the industry has bagged a huge export order up to 1.18-lakh bales from Syria.

This is the first time that the Indian jute industry has bagged such a huge order from Syria. Generally, Syrian orders for jute sackings go to Bangladesh. This year, it has turned out to be different. The Indian industry bagged the order after quoting a lower price.

The Syrian order is conducted by its official import-export agency called Nasiege. The order comprises 15,000 bales of cotton sacks, 3,000 bales of hessian cloth and one lakh bales for sugar twills, the latter being used for packing foodgrains.

As Per Business Line "Even on the domestic front, the Union Government has proposed the purchase of a substantial amount of jute sackings which would be used for packaging of foodgrains produced during the 2006-2007 rabi season. The purhases would be made by Government procuring agencies".

Industry sources said that while Punjab would be buying three lakh bales, Food Corporation of India would be buying 1.8 lakh bales. Uttar Pradesh would buy 1.25 lakh bales and Uttaranchal 20,000 bales through the Directorate-General of Supplies and Disposals.

Even the Haryana Government was eager to buy to the tune of 2.12 lakh bales. However, they are not sure about the modus operandi of the procurement. They will buy either through the official agency or from the open market.

Haryana floated a tender for 2.12 lakh bales, but it flopped as none of the jute mill owners participated in that bid. With this, the industry has presented a united stand against free market purchases.

As per Kohinoor Mandal "THE jute industry of West Bengal is yet to recover from labour woes though the strike called by the central trade unions has been averted with the signing of a tripartite wage agreement.

Industry sources said the sector was still suffering from poor demand both in the domestic and international markets. As a result, prices in the raw jute market also remained subdued and there was a distinct lack of sellers.

The industry's major customer, Food Corporation of India, is yet to purchase its full requirement of jute bags required for the packing of the rabi crop. The industry is expecting that the order will be released soon so that it matches the purchase level of last year.However, the most troublesome issue continues to be labour. Earlier this month, the State Government helped the sector ward off an indefinite strike threat called by the 18 central trade unions. After several rounds of discussions, a wage

agreement was signed between the trade unions and the mill owners, which, for the first time, incorporated a productivity clause.

All the central trade unions were party to the agreement; yet the deal has not been accepted by all the workers. In fact, the deal was opposed by two unions the Bharatiya Mazdoor Sangh (the trade union wing of BJP), and the Lenin Sarani wing of UTUC."

As per the present stipulations, **use of jute packing material is compulsory for upto 90 per cent in the case of both food grains and sugar and 15 per cent in the case of urea.** While the jute industry has been demanding continuation of the present packing order, the plastic industry has said the reservation should be done away with.

Indian Jute Mills Association had recently appealed to the Ahmedabad High Court against an court order in favour of Gujrat State Federation of Co-operative Sugar Factories regarding dilution in the mandatory jute packaging order. The court has recently passed an order on June 16 favouring dilution of the packaging or to 90 per cent for packing sugar and food grains and 15 per cent for fertilizer. The earlier stipulation was 100 per cent for food grain and sugar and 20 per cent for fertiliser.

The Kolkata gunny market suffered a moderate set back with prices of sacking somehow maintaining but hessian constructions reacting further due to continued poor demand in both domestic and overseas makets. While the price of standard B> Twill 21b remained unchanges at Rs.24,000 per tonne on heavy departmental buying of gunnies that of hessain 70oz closed the week lower by Rs. 200 to Rs. 30,100 per tonne on trred bull liquidation followed by sustained near pressure.

During the september 2001 under review, there was no departmental buying of branded bags but the local gunny trade and jute industry were optimistic about two lakh bales of jute bags early next week for August delivery and almost similar quantity in end-August for September2002 to fulfil the targeted quantity of 7.45 lakhs bales for kharif foodgrain procurement. In fact, the industry's monthly sacking production capacity of 75,000 tonnes or so was almost fully booked till September2002 and industry was hardly left with any excess production of sacking materials to sell in the open market.

Besides, week demand from commodity sector, the off take of A. Twill bags by the sugar industry was yet to be started with the new canecrushing season to begin from October onwards. But for the heavy government buying, gunny prices would have crashed on a broadfront. Admittedly, the industry appeared to be quite comfortable with its sacking production, thanks no sustained departmental support but it was not so in case of hessain.

Sustained government buying of sacking and falling raw jute prices prompted many closed jute mills to reopen after settling their scores with trade unions and labour. In fact, out of 17 jute mills which issued work suspension orders during the last seven months or so, no less then five jute mills had already resumed production and according to state labour department sources another four or five mills would reopen before the end of July.

Conclusion:

The jute industry is the prominent area where growth is indispensable which could be the revenue model for the government, employees and consumers. There are

various problems in jute industry regarding low awareness of jute products, high cost, fluctuating prices,bad condition of farmers low quality etc .The government is coming with multischemes to lift the jute industry.
Exports is one of the revenue source for jute mills.
As India is only largest producer of jute, we have lots of scope and opportunities to ensure this segment globalised.

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- Indian Jute mills Association
- Various Websites like globaljute.com,worldjute.com,indiajute.com,jmdcindia.com

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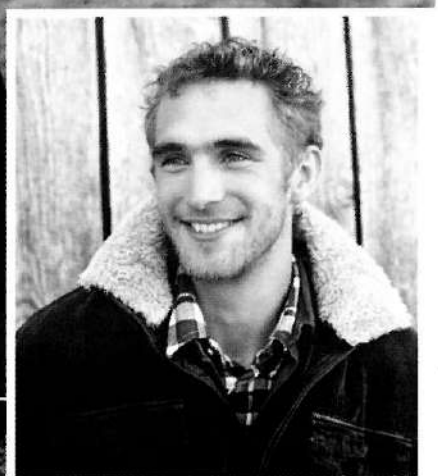

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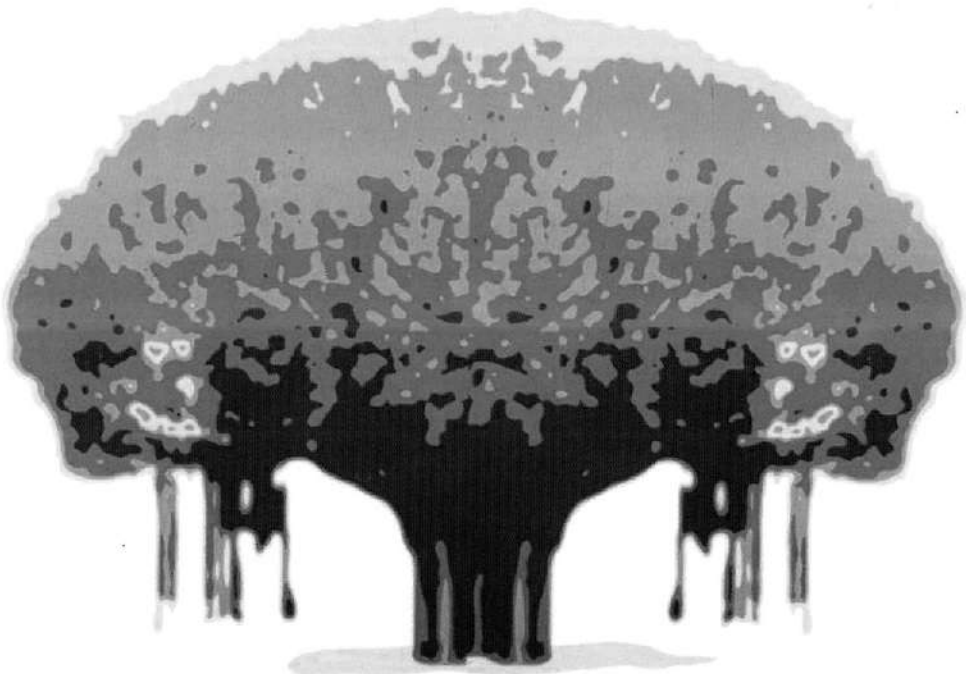

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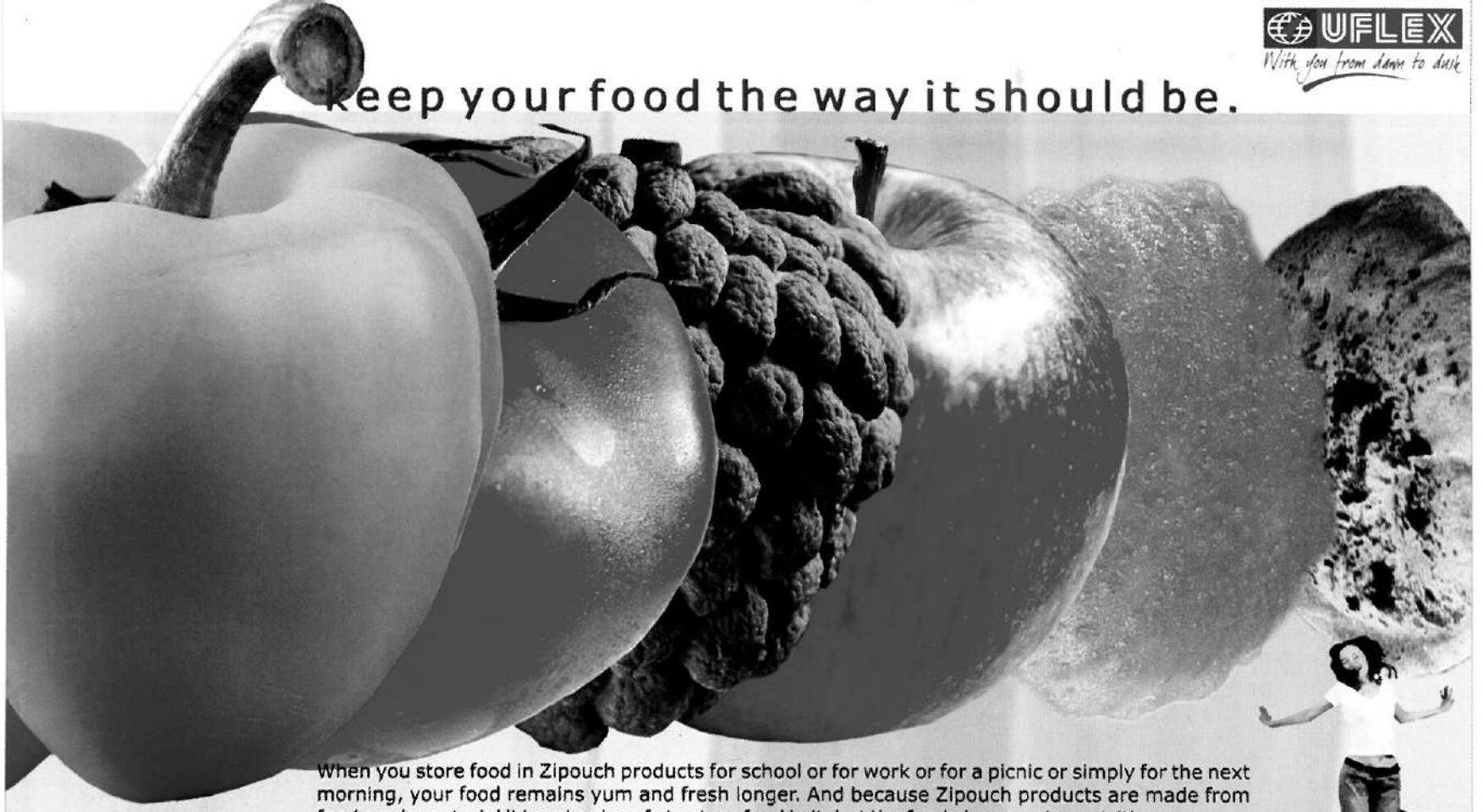

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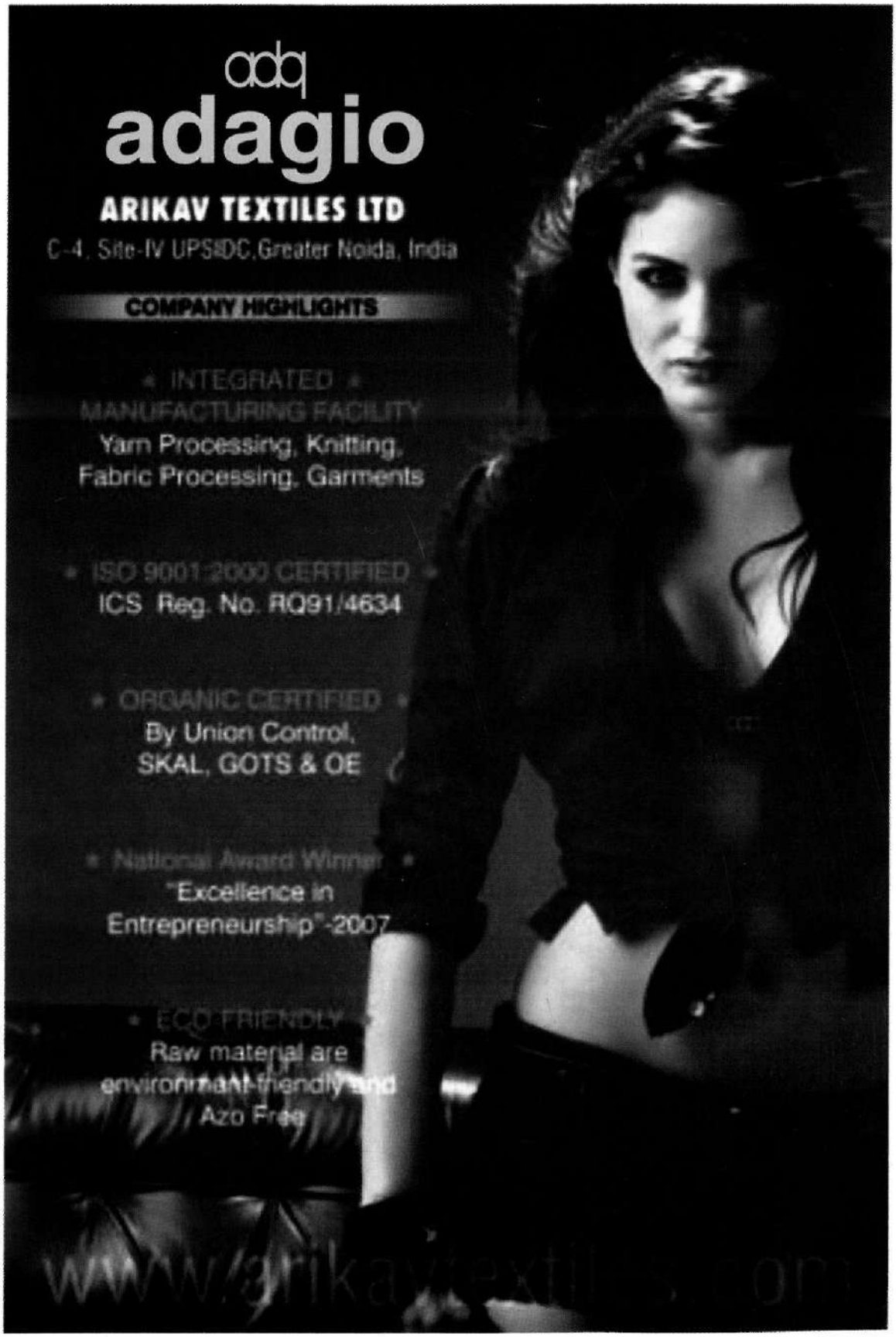
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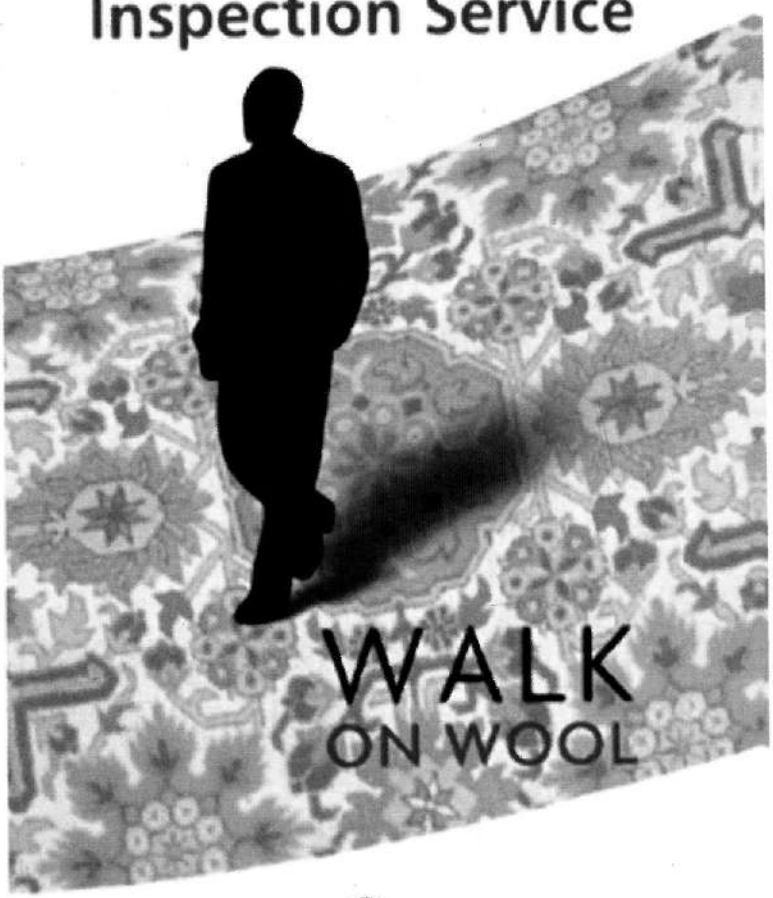

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