

# **INNOVATIONS IN THE TEXTILE & APPAREL INDUSTRY**



सत्यमेव जयते

**Ministry of Textiles**

2014

# Contents

Innovations	5
Innovation Set Up Under Ministry of Textiles	6
Textile Sectoral Innovation Council	8
Institutionalized Mechanism for Innovation under the Ministry of Textiles	9
Purpose of Innovations	15
Innovations in Textiles Sector	16
Case Studies	17
A Key Innovations	40
B Innovations in Product	47
C Innovations in Process	81
D Innovations in Machinery	88
E Innovations in Marketing	102



# Message

## FROM THE HON'BLE MINISTER OF STATE FOR TEXTILES (IC)

It gives me immense pleasure to introduce to you the whitepaper on the innovations carried out by various bodies under the aegis of Ministry of Textiles. With the announcement of 2010-20 as the decade of innovation, the focus has come on revolutionizing the Indian economy through radical and creative thinking. To develop a strong and sustainable practice for innovation on a continuous basis, it is important to promote a proper mix of young and experienced minds.

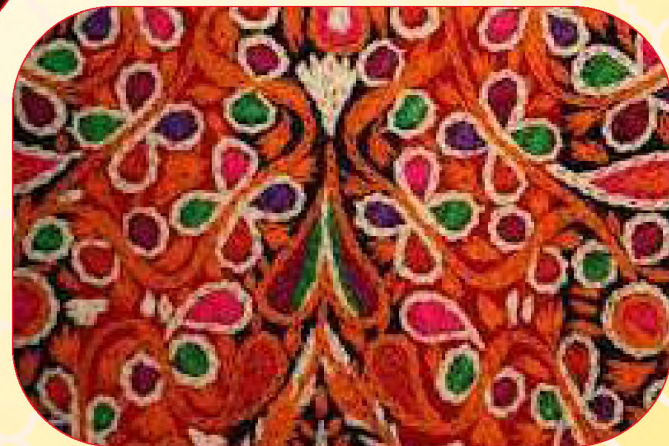


While fresh and unique ideas are the seed for development of a culture of innovation, commercial feasibility and adoption of these innovations is the fruit. Acceptability of the innovation and its subsequent adoption will be required to develop a sustainable culture of innovation. Only when we are able to come out with innovations on a continuous basis, we will be able to achieve the commercial acceptability of a few.

This whitepaper details out the innovations carried out by various textile research associations, design institutes and departments under the Ministry of Textiles. I am pleased to inform that all the associations have done a commendable work in coming out with very apt and practically relevant innovations.

All the innovations will help in solving some of the very important problems faced by various segments of the textiles and apparel industry. Significant improvements will be seen in the sector through the acceptability of the innovations while many more opportunities for improvement still remain to be tapped. I hope this whitepaper will be helpful in instilling a belief in innovation so that all the problems can be tackled effectively and efficiently.

Santosh Kumar Gangwar  
Minister of State Textiles (IC)  
Ministry of Textiles  
Government of India



# Foreword

The Indian Textile and Apparel industry has been a significant contributor to the Indian economy and continues to play a pivotal role in India's growth story through its contribution to industrial output, employment generation and export earnings. The size of the Indian Textile and Apparel industry is estimated to be Rs. 5,30,000 Crores. It contributes 14% to industrial production while its share in Indian exports stands at a significant 12%. India is one of the few countries with a complete and integrated textile value chain having production at each level of textile manufacturing with an overall annual growth of 8.9%.



At a time when China is vacating manufacturing space, a huge opportunity has come knocking at India's door and innovation is the need of the hour to outpace competitors and grab the market opportunity. National and sectorial innovation councils have been formed to give the desired impetus to innovation in the 'Decade of Innovation'. Accordingly a Textile Sectorial Innovation Council has also been formed and we would like this body to develop as a premier body for churning and channelizing ideas for continuous growth of the sector.

This compendium is a first step towards the development of an innovative culture, and attempts to document and recognise the innovations made by various associations, institutes and departments of Ministry of Textiles. I commend and congratulate the innovators for the novel ideas generated by them. I hope, this whitepaper will prove to be useful and will also serve as motivation for others to come up with fresh ideas in all areas of process, product, communication and organizational innovation in the future

Zohra Chatterji  
Secretary,  
Ministry of Textiles,  
Government of India

# Preface



In recent years, India has emerged as a vibrant and resurgent economy with adequate capital formation, young and large human resource base, rising domestic demand and a vast network of public funded R&D institutions. In spite of such a fertile and conducive environment, the country has not been able to leverage its potential towards technology and innovation driven sustainable growth path.

The Indian Textile and Apparel Industry in its numerous years of existence has become one of the few industries which form the base of the Indian economy. With the industry entering its transformation phase, the time is ripe for novel ideas to be presented and implemented which can place it on the high growth path. The need is to nurture young, creative and experienced minds to develop path breaking ideas. New ideas will help the industry achieve competitive advantage, weed out inefficiencies and streamline the entire supply chain.

While innovation is certainly a spontaneous and often unpredictable phenomenon, we believe that industry and department leaders can play an important role in creating an enabling environment for innovation to thrive on a sustainable basis. With this belief, as a part of its initiative to further Government's innovation agenda, the Ministry of Textiles has made an attempt to capture some of the innovations undertaken by various textile research associations, design institutes and other organizations in the form of a whitepaper. While there can be innovation at all levels of the results chain, we have endeavoured to highlight the final benefits from innovation, for use by the citizens and our stakeholders.

We are indeed aiming to achieve innovation in Government by design rather than by chance. The objective is to initiate and set in motion processes that will create a culture within Government to encourage, identify, celebrate and reward innovations.

I would like to thank all the organizations for their support during the course of development of this whitepaper. I hope this document will motivate the industry and other organizations in formulating a cohesive and inclusive agenda for developing a sustainable innovation ecosystem to facilitate greater innovative performance.

Monika S. Garg  
Joint Secretary  
Ministry of Textiles,  
Government of India





# Innovations

Innovation is the process which brings together novel ideas and solutions that meet new requirements or already existing needs. It refers to doing something different which has a positive impact on the society. Innovation differs from invention in that innovation refers to the use of a better idea or method, whereas invention refers to the creation of the idea or method itself.

In recent years the business environment has undergone a major shift where a heightened pace of change has become the new normal. To survive in such a dynamic environment a constant focus on innovation is fundamental. The competition is keener and the challenge is tougher which is why innovation becomes most important than ever to provide the needed competitive advantage.

Innovations can take shape by extensive research and development, from practice and even by chance. The more radical and revolutionary innovations tend to emerge from R&D, while more incremental innovations may emerge from practice. Knowledge and thought can be applied to produce new solutions, services, processes, products and experiences. Taking cue from the past, innovations can happen across the following:

- a. Product**
- b. Process**
- c. Machinery**
- d. Marketing**
- e. Business Model**
- f. Organization**

Innovation is the engine for growth and national competitiveness of the country. It will turn out to be a key element in providing aggressive top-line growth and for increasing bottom-line results of the organization, the cumulative effect of which will boost the innovation performance of the country.

# Innovation Set Up Under Ministry of Textiles

To drive the innovation agenda in the country across the textiles sector, it is important to understand and analyse the innovation quotient in the sector. Apart from this, it is also crucial to identify the challenges and opportunities in the sector. Hence, a Textile Sectorial Innovation Council (TSInC) has been constituted under the chairmanship of Secretary (Textiles).

To implement the objectives of the TSInC and to push the innovation agenda in the textiles sector, an action plan was prepared in the Ministry of Textiles under which two teams have been setup comprising a Multidisciplinary Innovation Lead Team for bringing about process and organizational innovation and an Innovation Task Team for selection and approval of innovative ideas for implementation.

## **Innovation Action Plan**

An action plan for enabling innovation in the Ministry of Textiles was released on 17th May, 2013 as per the guidelines prepared by Performance Management Division of Cabinet Secretariat. The objective of the Innovation Action plan (IAP) is to create a culture of innovation in the Ministry of Textiles to promote administrative and managerial innovation. The details of the plan are given below:

### **a) Objectives to be achieved**

- Creating a system to receive, collate, facilitate, encourage and reward innovative ideas
- Sharing industry problems on the portal to get solutions from users and creating a reward mechanism to make the process sustainable
- Forming an Innovation Task Team under the chairmanship of Secretary (Textiles) with representation from all the divisions of the ministry

### **b) Expected benefit/impact towards development of innovation culture**

- Development of leadership initiatives and key interest in the program
- Involvement of both customers and the stakeholders
- Commitment from the ministry for the development of a sustainable innovation environment

### **c) Activities to be undertaken**

- Giving recognition by providing photo space and write up on contributions made by a stakeholder on an innovation page on the Ministry's website
- Budgetary allocation to be earmarked for:
  - Implementation of innovative ideas
  - Incentivizing employees and users
  - Rewarding solution providers from the user network

- Sending letters to industry, associations, councils, etc. disseminating information about the systems created
- Undertaking departmental communications giving information about the initiative
- Initiating IEC campaigns involving SMS, print and electronic media and social networking sites

#### **d) Participants**

- All the stakeholders and users
- Innovation cell with representation from all the divisions of the ministry
- Central/State implementing agencies in coordination with NGOs, communities, SHGs, R&D centres and academic institutions

In regard to the innovation action plan, a Multidisciplinary Innovation Team and an Innovation Task Team were constituted on 24th June, 2013.

The multidisciplinary team is headed by DC (Handloom). The task and responsibilities of the team will be:

- To identify the goods and services delivered to the public through ministry and suggest areas for bringing about process and organizational innovation such that the quantity and quality of services are significantly improved.
- To develop EOI/RFP for engaging providers, where required, for re-engineering of processes and systems for better service delivery.
- To evaluate and develop the ideas received from employee's corner and view corner regarding restructuring of processes and delivery of public services in a transparent and efficient manner.
- To review and shortlist proposals for innovation to be taken up for implementation.
- To identify policy challenges, implementation challenges and communication issues and evolving a strategy to address them.
- To identify experts and subjects for professional talks.

The Innovation Task Team is under the chairmanship of Secretary (Textiles). The task and responsibilities of the team will be:

- To select and approve the innovative ideas for implementation taking into account the ideas suggested by the multidisciplinary team, employees and users.
- To review implementation of the IAP and suggest necessary course correction where required.
- To evaluate quantity and quality of innovation introduced through IAP.
- To monitor the investment made by Central Public Sector Enterprises (CPSEs) in research, development and innovation and outcome thereof.
- Holding brainstorming sessions with participation from a cross section of the stakeholders to keep the organization abreast with challenges and opportunities in the sectors and devise strategies for overseeing the same and receive feedback on implementation of IAP.

# Textile Sectoral Innovation Council

In order to drive innovative strategies in key sectors and create multiple roadmaps, the National Innovation Council (NIC) is encouraging the creation of multiple Sectoral Innovation Councils which would enhance innovation capabilities in respective sectors. In this regard, a Textile Sectoral Innovation Council has been constituted to help the textile ministry in creating a culture of innovation. The council will suggest policy interventions to spur innovation in their respective sectors.

The focus is on improving the innovation quotient and competitive growth in the sector in the next decade with a special emphasis on inclusive and sustainable innovation.

## **The objectives of Textile Sectoral Innovation Council are:**

- Focus on innovations in the textile sector
- Map opportunities for innovations in the sector
- Help create innovation eco-systems
- Encourage young talent and local universities, colleges, industries and R&D institutes
- Identify and reward talent in innovation and disseminate success stories
- Organise seminars, lectures and workshops on innovation
- Provide support to promote innovation in the sector
- Encourage innovations in public service delivery
- Suggest steps for improving delivery of services, products & processes for citizens
- Suggest process re-engineering with focus on user experience and efficiency
- Improve service delivery mechanism with a focus on transparency and accountability
- Prepare a Sectoral Roadmap for Innovation 2010-2020

# Institutionalized Mechanism for Innovation under the Ministry of Textiles

Ministry of Textiles has institutionalized a mechanism to take up the objective of continuous innovation. Under this, the ministry has established several institutes and research associations which come up with innovative projects. The key focus institutions which develop innovations are shown below:

Key Institutions which Develop Innovations



The names of the establishments associated with each institution are given below:

Development Commissioner (Handloom)	Development Commissioner (Handicraft)	Textile Research Associations (TRA)	National Institute of Fashion Technology (NIFT)	Other Centres of Excellence (COE)
<ul style="list-style-type: none"> <li>Indian Institute of Handloom Technology (5 centres)</li> <li>National Centre for Textile Design</li> <li>Association of Corporations Apex societies of Handloom</li> </ul>	<ul style="list-style-type: none"> <li>National Centre for Design and Product Development</li> <li>Institute of Carpet Technology</li> <li>Metal Handicrafts Service Centre</li> <li>Council for Handicrafts Development Corporations</li> <li>Bamboo and Cane Development Institute</li> <li>Craft Development Institute</li> </ul>	<ul style="list-style-type: none"> <li>Ahmedabad Textile Industry's Research Association (ATIRA)</li> <li>Bombay Textile Research Association (BTRA)</li> <li>South India Textile Research Association (SITRA)</li> <li>Northern India Textile Research Association (NITRA)</li> <li>Man-Made Textiles Research Association (MANTRA)</li> <li>Synthetic and Art Silk Mills Research Association (SASMIRA)</li> <li>Indian Jute Industries Research Association (IJIRA)</li> <li>Wood Research Association (WRA)</li> </ul>	<ul style="list-style-type: none"> <li>National Institute of Fashion Technology - 15 Campus               <ul style="list-style-type: none"> <li>Bengaluru</li> <li>Bhopal</li> <li>Bhubaneswar</li> <li>Chennai</li> <li>Gandhinagar</li> <li>Hyderabad</li> <li>Jodhpur</li> <li>Kangra</li> <li>Kannur</li> <li>Kolkata</li> <li>Mumbai</li> <li>New Delhi</li> <li>Patna</li> <li>Raebareilly</li> <li>Shillong</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>National Jute Board</li> <li>Central Silk Board</li> </ul>

Some of the major efforts taken up by the Ministry of Textiles (MOT) in innovation include-

1. Development of design and technology up-gradation scheme under which around 40-50 craftsperson get financial assistance. Also design and technology workshops are conducted for 15 days. The success of the scheme can be realized from the fact that during the year 2013-14, a total of 209 design and training workshops were conducted and training was provided to a total of 4,140 artisans. Also, financial assistance to the tune of Rs. 1,433 lakhs was provided to the needy artisans under the scheme.
2. Setting up of a common facility centre to provide infrastructural and skill development support to cluster stakeholders for improving the product quality and designs. Currently, there are around 100 CFCs in Handloom clusters.
3. Development and supply of improved modern tools kits to artisans every year to create the best innovative designs all over the world.
4. Institutionalisation of mechanisms in institutes like NIFT, DC (Handlooms), DC (Handicrafts), Research institutes including Nitra, Sitra, Ijira, Atira, Btra etc.
5. Institutionalisation of 3 design awards for rewarding artisans and weavers for their innovative work in handloom and handicraft.

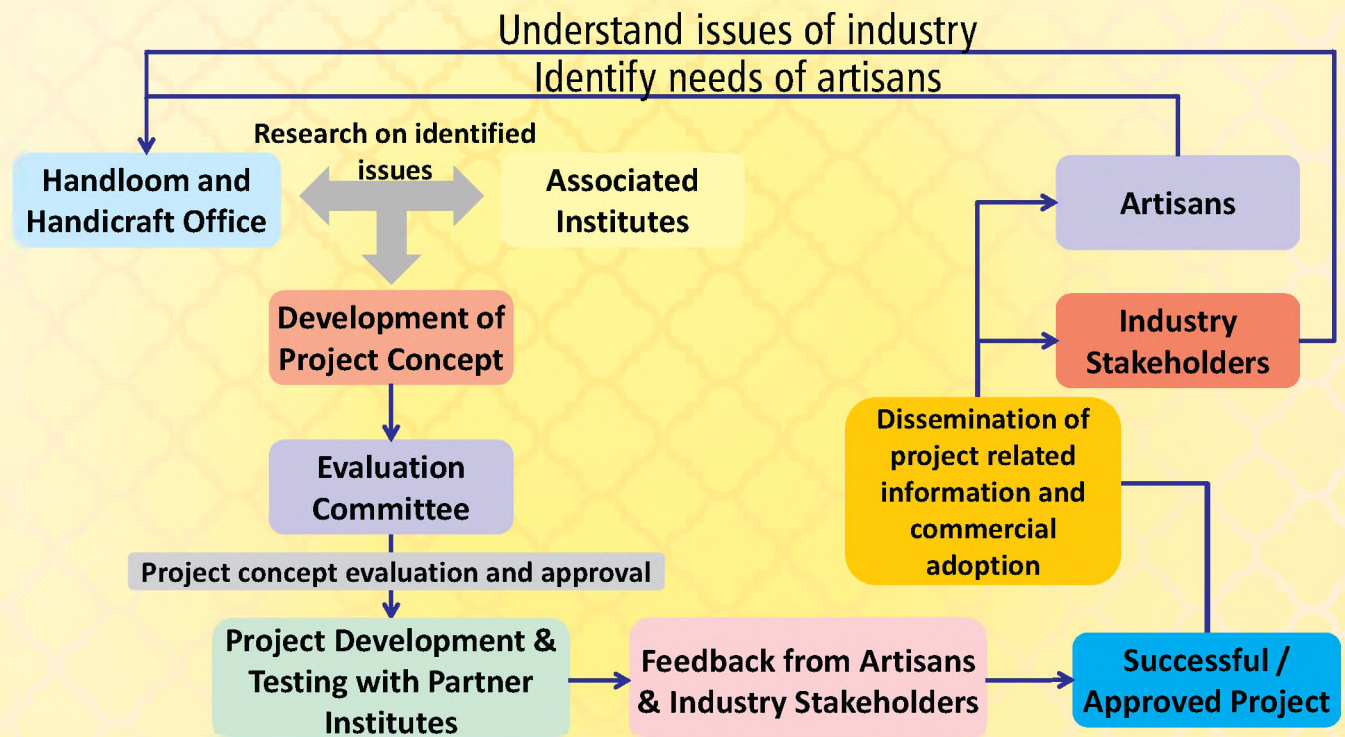
## Innovation Framework in Handloom and Handicraft Organization

The handlooms and handicrafts sectors have already institutionalized the process of innovations through the establishment of many design and development institutes. These institutions have an objective of undertaking research and development projects on a continuous basis.

Innovations are developed on the basis of identification of need. The handloom and handicraft offices act only as the funding and coordinating agencies for these projects while the actual developmental work is undertaken by the institutions associated with them. Funding for all the projects is provided under the R&D scheme of the Textile ministry.

The institutionalized mechanism developed by Handloom and Handicraft sector for delivering innovations is shown below:

### Mechanism for Development of Innovations



The office of the development commissioner of Handloom and Handicrafts in association with the partner institutes in the field of handloom and handicraft acts as the apex body of the whole system which deals with innovation. These associated institutes have a separate team for primary research. The main objective of this team is to interact with the various industry stakeholders and artisans to gather their feedback on the issues being faced by them. These interactions usually take place during the different seminars and conferences organised by the Ministry of Textiles and the associated bodies.

On the basis of these interactions major issues are identified and need for the innovations is developed. The institutions conduct a detailed background research both primary and secondary, on these identified issues and develop a concept for the research project. This concept note is submitted to the project evaluation committee in the Ministry of Textiles for approval.

The project evaluation committee consists of various subject matter experts who then evaluate the feasibility and need for the project and give their approval. Actual development of the innovation followed by detailed testing work is done by a team of technical experts from the institutes associated with the handloom and handicraft office. After the product has successfully passed all the tests, a seminar or workshop is organized to get feedback of artisans, weavers and industry stakeholders. On the basis of feedback received the product is further refined.

Once the validity and success of a project has been established, information relating to the project is disseminated among all the industry stakeholders. The report is also shared with the artisans and weavers in a language which can be understood by them. Post dissemination, sale and purchase orders from the industry for commercial usage are placed which are catered by the associated institutions. Apart from this, to motivate the craftsmen and to help them develop innovative designs, Textile ministry has come out with various awards.

- **Shilp Guru Awards** – These are given to master craftsperson of Handicrafts for their valuable contribution to the industry. Each award consists of one mounted gold coin, one shawl and a citation. In addition, financial assistance of Rs. 7.5 lakhs is provided for developing ten innovative and creative projects of high level of excellence, high aesthetic value and high quality.
- **Sant Kabir Awards** – Similar to Shilp Guru, Sant Kabir awards are given to handloom weavers for their significant contribution to the industry. It consists of one mounted gold coin, one shawl and a citation. In addition, financial assistance of Rs. 6 lakhs is provided for developing ten innovative and creative projects.
- **National Awards** – These are given to master craftsperson and master weavers. It includes a cash prize of Rs. 1 lakh, a copper plaque and an angavastram.



## Innovation Framework in National Institute of Fashion Technology (NIFT)

A unique mechanism has been developed by the National Institute of Fashion Technology (NIFT) to sensitize their students to innovate at the grass root level. An academic “Cluster Development Initiative” (CDI) was started by NIFT to provide innovative design, technology and capability for inclusive and sustainable growth of various handloom and handicraft clusters. Over the years NIFT through its multiple centres have formed inroads into various state based craft and cottage industries, mapping and documenting the craft heritage of India. The information collated over the years for craft documentation provides background for a much more meaningful and enriched intervention to innovate at the cluster level.

Under the CDI, all students from design and management departments visit a cluster at least once during their course of study at NIFT. They undertake a survey or conduct workshops as per the objectives set for them before hand, keeping in view their specialisation and requirement of the cluster.

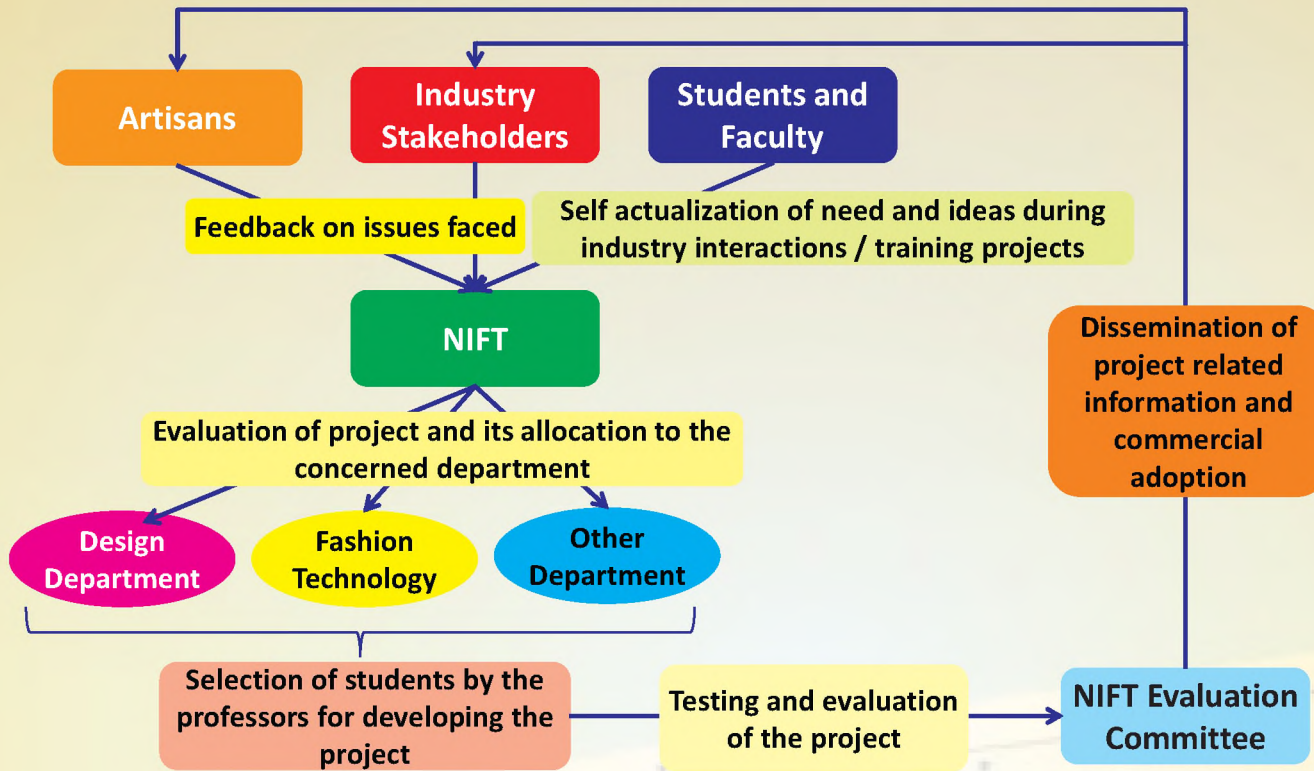
The approach towards the cluster development involves regular and systematic intervention by the students and faculty, with the clear-cut objectives. The initiative has phase wise activities to ensure identification of gaps, skill up-gradation and technological development.

Students from different streams provide inputs to the artisans at grass root level. Students of design provide market intelligence to the craftsmen while technology students undertake process innovation and planning. The focus is on innovation, sustainability and growth.

Apart from this initiative, NIFT has made innovation an integral part of the study. NIFT as an organization, responsible for implementing the Cluster Development Initiative, continuously interacts with various industry stakeholders as well as the artisans and weavers. Also, being an institute imparting education in fashion technology, NIFT faculty encourages students to take up innovation projects as their final graduating projects. Faculty also involve alumni to take up sponsored projects in design, training and product development or diversification.

The framework of innovation developed by them is represented below:

## Mechanism for Development of Innovations



As NIFT Students work closely with grass-root level artisans, sometimes the students are approached by NGOs or other developmental organizations to step in to address their problems. These could be design, technology or marketing challenges. Faculty encourages students to study the problem to come out with a project proposal. Similarly Industry also approaches NIFT to suggest solutions, which are processed for proposals.

After the need of the project is established a project concept is developed which is submitted to NIFT for evaluation. As a first step, the evaluation committee, comprising of faculty from different departments, assess whether NIFT can really add value to the project. If the project is found to be viable, final approval for the project is given followed by its allocation to a professor / head of the concerned department. Selection of students to carry out the project is done by the faculty concerned, in case it is not the graduation project.

Student or groups of them carry out the work which is closely monitored by the faculty mentor. The product or process is tested to validate its functional and technical capabilities. Any refinement suggested during the feedback sessions organised by NIFT is done by the students. All these activities are conducted in-house by the NIFT team after which it is sent to the evaluation committee for final approval. Once the project has been approved by the committee, information relating to the successful/ approved projects is disseminated to the industry.

# Purpose of Innovations

**01**

Improve the working conditions of workers

**05**

Replace older, slower and conventional machines by faster, technologically advanced ones

**02**

Design and develop products with improved functional properties

**06**

Have a positive impact on environment by reducing discharge of effluents

**03**

Increase efficiency and hence productivity of workers

**07**

Increase the visibility of Indian textile industry

**04**

Develop cost effective processes

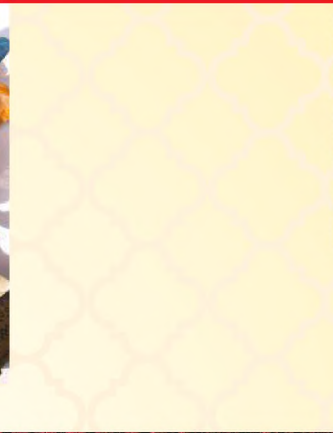
# Innovations in Textiles Sector

The various textile research associations, design institutes and departments of the Ministry of Textiles are already doing innovation in their routine course of working. Innovations which are happening in the textile sector are helping in increasing the efficiency of operations, developing specialized products, bringing technical up-gradation in the industry and improving the life of workers. Innovations may be broadly categorised as follows:

- a) Product e.g. development of microwave friendly vessels, development of barbed bidirectional sutures, replacement of P/C fabric by NYCO, etc.
- b) Process e.g. Development of no salt, low alkali dyeing of cotton textiles, Development of a sustainable textile process for enzymatic preparatory of cotton textiles, etc.
- c) Machinery e.g. Development of technology for waste minimization on rapier loom, machine for determining heat and light cutting ability of curtains, etc.
- d) Marketing e.g. Online marketing of handloom products, live webcast of events, etc.

Some of the innovations across Textiles Sector undertaken by different agencies of Ministry of Textiles are produced in subsequent pages.





# CASE STUDY



# Transformation of 'Commonplace' Jhabua Dolls into an 'Aspirational Artifact'



## Jhabua Dolls

Jhabua, predominantly a tribal district, is located in the western part of Madhya Pradesh. The soil condition and vagaries of the weather make agriculture a very unpredictable and difficult occupation in Jhabua. So the tribals engage themselves in other small occupations to supplement their incomes. The women engage themselves in tribal handicrafts like bamboo products, dolls, bead-jewellery and other items.

The tribal corporation has promoted a lot of income generating crafts and imparted training for the same. The Jhabua dolls traditionally represent the tribal men and women dressed in colourful dresses. The costumes are often embellished with beads, spangles and tassels. These dolls in various shapes, sizes and varieties have become quite famous as artifacts and gift items.

### NIFT Intervention

Minor improvisations in raw material and better finishing to the existing Jhabua Dolls, transported a 'commonplace' product to an aspirational 'artifact'.



*The new products were well accepted in the contemporary market. The trained artisans were able to add to their portfolio of products as per the market and client brief with the help of the crafts based exploration workshops by NIFT students.*

Contemporary products like key chains, refrigerator magnets, tabletop accessories, photo frames and others were introduced to expand their product line leading to increase in income without addition in cost



# Terra Cotta Pottery

## Microwave Friendly Terracotta Vessels with a New Visual Identity



The known origins of Indian pottery date back more than 5,000 years, from wheel-made fragments and vessels that have been found from the peoples of the Indus Valley civilization. These include vessels for food storage and human remains, cups and utensils.

Terra cotta is the oldest material used in Ancient Indian pottery, and has a number of uses for both utilitarian and aesthetic purposes. It is simply natural, waterproof clay ceramic that is hardened and semi-fired in a kiln. Brightly colored iconic figures of Ancient Indian deities are some of the oldest and most famous pieces of this terra cotta style. The figures are made exclusively by women for particular ceremonies, and are offered as a tribute to the gods or as tools for religious rituals. Terra cotta material is also very widely used to make vessels, utensils and cups of various shapes and sizes for storing and serving food.



### NIFT Intervention

To increase the scope of application of terra cotta vessels and utensils, NIFT students have developed microwave friendly terra cotta vessels. These students visited the cluster in Kerala to develop the product and conduct various tests to validate its properties.



For developing these heat resistant vessels, appropriate clay body was prepared by modifying the regular red clay used for pottery. The process involved removing impurities, filtering and mixing the clay with Kaolin to get proper plasticity of the clay body. To develop the prototype and the final body, the clay was given proper shape using the potter's wheel and then dried out using the kiln. Attractive vessels were prepared using black firing and the visual identity was given using slips and engobes.

*To assess the heat resistant properties of these vessels, various tests were conducted against the standard borosil vessels of same size.*



Apart from this trials were also undertaken for cooking vegetables, kheer, rice etc in the terra cotta vessels.

Terra cotta products have opened up a new and high value product range for the terra cotta artisans. These products also have an immense and niche market where people prefer organic materials.

# Handloom and Handicraft Cluster Development

## NIFT Initiative Impacting Different Handloom and Handicraft Clusters



Concentration of units in a given geographical location producing same or similar types of products and facing common opportunities and threats is called a cluster. India has more than 6400 clusters. These have been typified as industrial, handloom, and handicraft clusters. In a typical cluster, producers often belong to a traditional community, producing the long-established products for generations

In India, craft is an economic and social activity carried out to provide livelihood to a large chunk of population. But, what is truly outstanding is that in India, even today, the craft traditions are alive and thriving and are still breathing part of India's cultural and social life, in spite of increasing urbanization and globalization of consumer tastes and market demand. Craft traditions not only give meaning and order to the existence of India's people, but also provide domestic, social and religious framework. Designers in India have a unique advantage over their contemporaries elsewhere, as they are surrounded by the skilled craftsmen and diverse crafts, which provide opportunity for creative innovations and experimentation.

## NIFT Intervention

To provide craft and industrial textile clusters in India, with innovative design, technology and capabilities for inclusive and sustainable growth, NIFT began its Cluster Development Initiative (CDI) in 2005. The aim was to integrate capacity enhancement activities into NIFT academic curriculum by engaging its overall capabilities in design, management and technology. Along with this sensitization of students to the realities of the craft sector and insight into regional sensibilities and diversities, resources and environment was the additional objective.



Sponsored by the Ministry of Rural Development under SGSY (Swarn Jayanti Grameen Swarajgar Yojna) scheme and in collaboration with the respective state government, five NIFT centres (Delhi, Bengaluru, Chennai, Gandhinagar and Kolkata) adopted clusters for a specified period. The main objective of the initiative was poverty alleviation of the selected beneficiaries under the project. Total 635 Self Help Groups (SHGs) were formed. Under this project, 212 workshops were conducted for the artisans.

*Under the Cluster Development Initiative of NIFT, 7913 beneficiaries were identified and trained across five adopted clusters.*



Under CDI, all NIFT students work at the grassroots level, with the artisans and weavers. Along with this they have to visit a cluster at least once during their course of study. They undertake a study or workshop as per the objectives set for them beforehand, keeping in view their specialization and requirement of the cluster. The initiative has phase wise activities to ensure follow up and consistent growth in terms of identification of gaps, skill up-gradation and technological development at cluster level.

This initiative has helped in the overall development of the traditional arts and crafts cluster along with the people involved. Also it provides insights into the development of marketable designs which helps in the commercial growth of the artisans.

In order to fulfil its social responsibilities, NIFT continues to play a proactive role in the cluster development, by creating an environment that anticipate, understand and implement the concepts associated with the conceptualization, design and production of crafts and textiles for appropriate markets.

# Improvisation of Maheshwari Weaving



## **Maheshwari Weaving**

The traditional Maheshwari weaving belongs to Maheshwar, a town located in the West Nimad district of the state, prevalent between the 3rd and 2nd century B.C. On the banks of river Narmada, the small town of Maheshwar is on the textile maps of India for producing the most exquisite saris. Famous for its weaving, it reached its cultural zenith during the rule of the Maratha queen Devi Ahilya Bai Holkar, who encouraged weavers to come and settle in this region and patronised the weaving of the Maheshwar saris.

The motifs woven in these textiles are primarily inspired from the detailing on the walls and niches of the Maheshwar fort. To this day, the motifs remain geometrical and the design repertoire remains traditional. The most common ones include chatai (woven mat pattern), heera (diamond pattern) and chameli ka phool (Jasmine flower pattern).

These elegant saris of cotton and silk-blend use subtle colours and textures which are often created by using different shades in the warp and weft. With uncomplicated patterns, elaborate borders and subtle colours, these weavings are personification of elegant royalty. The saris have exotic motifs done in zari and pleasant colours which are both inspired by the hues and forms in nature.

### **NIFT Intervention**

The capacity building and skill development workshops were carried out for villagers of Badgaon, Sayata and neighbouring areas to strengthen weaving skills in order to cater to huge demand of Maheshwari fabric and products.

With the support of NIFT project team, the villagers formed Self Help Group (SHG) named Kewat SHG. The SHG was provided work orders from NIFT as well as from local market. The SHG members now regularly participate in craft melas and exhibitions at district and state level. Design intervention and direct benefits were clearly demonstrated through bulk order received by artisans of Keria Kheri and others in Maheshwar by Fabindia.



Samples developed under craft based exploration workshop involving artisans and NIFT students, received huge appreciation and opened possibilities of unusual combinations in pattern. Motifs were introduced to bring newness to the existing motif and border designs.



*Converting the Maheshwari fabric into home furnishings using the Ikkat dyeing technique was also introduced and taught to the artisans by the NIFT students.*

Updating of design information through trend and forecast workshops led to introduction of new colour for contemporary market acceptance of the Maheshwari products. The artisans were further trained in planning, designing, graph making and graph interpretation techniques. Selected artisans were trained at NIFT, New Delhi, in design methodology, pedagogy, skills, weaving processes etc. as mainers, to provide further training to the remaining artisans and dissemination of design intelligence in the cluster.

# Zardozi Crafts

## Redesigned Hand Embroidery Frame and Seating for Zardozi Craftsmen



### Zardozi Crafts

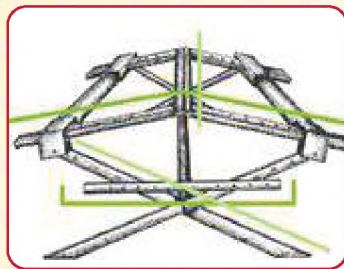
A Persian embroidery form, Zardozi attained its summit in the 17th century, under the patronage of Mughal Emperor Akbar. Zardozi embroidery work is mainly a specialty of Lucknow, Bhopal, Hyderabad, Delhi, Agra, Kashmir, Mumbai, Ajmer and Chennai.

Zardozi embroidery is beautiful metal embroidery, which was once used to embellish the attire of the Kings and the royals in India. It was also used to adorn walls of the royal tents, scabbards, wall hangings and the paraphernalia of regal elephants and horses. Zardozi embroidery work involves making elaborate designs, using gold and silver threads. Further adding to the magnificence of the work are the studded pearls and precious stones. However, today, craftsmen make use of a combination of copper wire, with a golden or silver polish, and a silk thread.

The process of doing Zardozi embroidery starts with the craftsmen sitting cross-legged around the Addaa, the wooden framework, with their tools. The tools include curved hooks, needles, salmaa pieces (gold wires), sitaaras (metal stars), round-sequins, glass & plastic beads, dabkaa (thread) and kasab (thread). The second step in the process is to trace out the design on the cloth, if possible fabrics like silk, satin, velvet, etc. The fabric is then stretched over the wooden frame and the embroidery work begins. Needle is used to pull out each zardozi element and then, it is integrated into the basic design by pushing the needle into the fabric.

### NIFT Intervention

During visits to different clusters, NIFT students studied the body postures of zardozi artisans working on Khatali with ari needle. Zardozi artisans usually have to work for more than 8 hrs in uncomfortable positions with legs uncomfortably bent, twisted and burdened by body weight. This leads to various occupational hazards like severe back pain, inflammation of joints etc. Also working in improper positions decreases their efficiency and productivity.



*In order to provide the craftsmen with proper working position, NIFT has re-designed the Khatali.*

As an initial step, the NIFT students studied the different parts of Khatali and identified the parts which should be modified. On the basis of the assessment, the Khatali was re-designed to provide easy to adopt, customized solutions to each individual's requirement using the available resources and material around the area. With the re-designed Khatali the workers can now work more comfortably and easily. The improvement in posture has also led to increased efficiency amongst the zardozi workers.



# Traditional High Speed Charkha



Ordinary Charkha

## Traditional Charkha

The Charkha is a small device which can be used to spin fiber, such as cotton, into yarn. Fabric from this yarn can be used to make all sorts of clothing.

Charkha was manufactured by craft-experts from the wood of babul, neem or shisham. It was adorned with colours, paintings, metallic designs or pieces of glass to attract the prospective buyers. The thread that links the wheel with the spindle is mahal. The spindle is takla and the handle of the wheel, hatthi. The beads employed as shafts for the spindle are called manka. The leather object through which the spindle passes is chamari. That which holds the spindle vertically is munna. The thread spun on the Charkha is muddha which is finally placed in the chhiku, basket.

The table-top or floor charkha is one of the oldest known forms of the spinning wheel. The charkha works similarly to the great wheel, with a drive wheel being turned by hand, while the yarn is spun off the tip of the spindle.



### DC Handloom Intervention

Till today, the charkha provides livelihood to a significant population of handloom workers. With the introduction of technologically advanced machinery, the application of charkha has reduced but, it still supports many small handloom workers.

*The conventional charkhas have a very slow speed which limits the productivity of handloom workers.*



High Speed Charkha

Apart from this, the extra effort required to operate it reduces the operational efficiency. To improve the productivity and efficiency of weavers, intervention was made in the traditional designing of the Charkha.

In the traditional design, cranks and pedals are fixed directly to the hub. This increased the effort required to produce the yarn. This design was modified by shifting the pedal in between the two wheels for decreasing the effort required to operate the Charkha. In addition, gear system was introduced to increase the speed of the Charkha.

Due to its improved functional performance, these high speed Charkhas have been adopted by many handloom weavers across different clusters in India.

# Improved Frame Loom



## Ordinary Frame Loom

Frame looms form an integral part of the handloom industry due to its wide usage among the handloom weavers across clusters. It was observed that these handloom weavers working on frame looms operate in a very uncomfortable and difficult position. Due to such working conditions, the weavers are prone to various occupational hazards like severe back pain, inflammation of joints etc.

## DC Handloom Intervention

To improve the working condition of the weavers, Handloom Office has re-designed the ordinary frame loom into an improved frame loom. Along with this, the levers lengths and the pulley system have been optimised to reduce the effort and increase the operational efficiency.

*The improved frame loom is ergonomically designed to provide a comfortable sitting position to the weavers.*

Since the improved frame loom decreases the fatigue caused during machine operation these looms have been adopted by many handloom weavers in different clusters across India.

# Multiple Box Loom



## Traditional Loom

With the increasing industrialisation and the growing competition in the handloom industry, the need of the hour is to be efficient and fast. The traditional loom operates with only one shuttle which leads to wastage of time during changeover of the shuttle. While operating in a commercial environment, this wastage of time translates into an opportunity loss for the weaver.

## DC Handloom Intervention

In order to reduce this wastage of time, Handloom Office has adopted the technology used in powerloom sector. They have modified the traditional loom into multiple box loom using two shuttles. As soon as the first shuttle stops, the second shuttle automatically starts without stopping the loom. In the meantime, the empty shuttle can be refilled and reloaded in the loom.

*This technology intervention has significantly minimised the wastage in time during changeover, which has resulted in high utilisation of the loom.*

# Kinhal Wood Carving

## Redesigning of "Traditional Artifacts" Into "Educational Toys"



### Kinhal Wood Carving

Wood carving, is one of Karnataka's oldest crafts which was used to embellish the doors and ceilings of temple and temple chariot. In Northern Karnataka, a small village known as Kinhal is immensely rich in this cultural heritage. The ancestors of the traditional wood carvers 'Chitragars' are said to be the creators of the chariot at Hampi. Kinhal is known for its most exquisite wood carvings.

The 'Chitragars' use lightweight polka or hale wood, tamarind paste, soaked jute rags and dried saw dust powder to make the decorative wooden toys, idols of Gods, crowns and masks used in dramas, panels painted with mythological themes, cradles and furniture.

This imaginative craft is known for its realistic styling and the master touch of designing and exquisite chiseling. The Kinhal artisans of today draw inspiration from the famous mural paintings and the intricate works of the Virupaksha temple. However, Kinhal craft is now famous for the life like replicas of fruits and vegetables.

### NIFT Intervention

Kinhal wood carving being a well-established traditional craft of Northern Karnataka, as a result the design intervention was quite challenging. NIFT students conducted various workshops in Hampi and developed nearly 30 new designs along with the artisans through these workshops.



*Some of the traditional toys were converted into educational toys for increasing their usage in modern life.*

NIFT partnered with the regional design center's (RDTDC) master craftsmen from the DC handicrafts department. NIFT also developed networks to bring the new range of products into the mainstream. Today, the village has several artisans-entrepreneurs running their own businesses for an established product range. The range developed at NIFT and RDTDC workshops have market potential and the producers are in a position to take it forward as they desire.



# Traditional Hand Knotted Carpet Loom

## New and Improved Cross Bar Horizontal Loom



Cross Bar Horizontal Loom

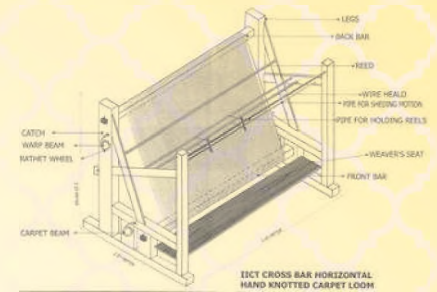
### **Traditional Hand Knotted Carpet Loom**

Traditional hand knotted carpet loom has been used by artisans for many years. These looms are operated by the artisans who work for more than 8 hours a day on them. With the advancement of technology, newer machines have replaced the old, traditional machines. But, the design of the hand knotted carpet loom has remained the same for many years.

Apart from this, the inappropriate design of the loom causes discomfort to the workers. The incorrect working posture results in various problems like joint pains, backache, etc. The traditional work environment limits the efficiency levels of the workers. In spite of all these challenges, no research was done to improve the design of loom, enhance productivity and reduce drudgery of artisans.

## DC Handicrafts Intervention

The first step towards improvement of working condition of artisans has been taken by Development Commissioner (Handicrafts). DC Handicrafts in association with the Indian Institute of Carpet Technology (IICT), Bhadohi has developed a new loom with improved warp path and design.



Design of the Loom



*The new loom has better ergonomics and visibility to the weaver so that workers can work continuously for longer hours.*

It also provides for a uniform and form knotting density. Apart from this the loom has faster, efficient and easier operations with simple technology suited to Indian village conditions. It provides safer weaving conditions with the flexibility to produce hand knotted and Tibetan/Nepal, Shaggy and Sumak on the same loom. Longer length of carpet can be produced on the loom.

# Revival of Traditional Recycling Art 'Kantha'

## in Domestic and International Market



Traditional Recycling Art

### Traditional Recycling Art 'Kantha'

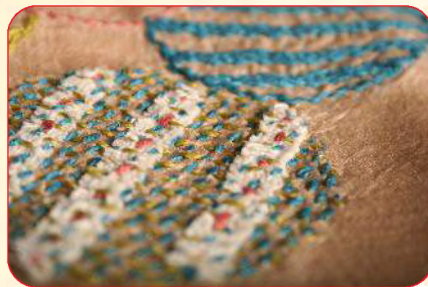
The Kanthas of Bengal, created by stitching together old work out and thread bare sarees in running stiches are expressive of the folk culture. In the rural areas of Bengal many of the ancient rituals have been handed down from mother to daughter and continue to be observed even today.

Kantha evolved out of necessity to drape or protect infants against cold. It started as a recycling art in which layers of old sarees were quilted together and embroidered on. Layers of old cloth were held together by the stitches which gave the surface a delicate, rippled look. Kantha was also said to be a lady's self-expression. Kantha patterns include motifs and themes drawn from the living world with a central design that is usually floral, border and corner motifs. The motifs are taken from folklore, mythological stories and day to day scenes experienced by the ladies who embroidered these with love and care. Traditionally, Kanthas were either made for gifts or for personal use but never for sale. Kantha is now embroidered on a diverse variety of products such as cushion, covers, bags, stoles, bedsheets and sarees. Nowadays the rich and exquisite Kantha embroidery has high appreciation in the international market as well.



### NIFT Intervention

Training was organized for the artisans in the cluster. The training had a focus towards skill development, design development and product development of various decorative and utility products along with sarees and dress materials.



During the course of training emphasis was given more on colours, design motifs and use of various types of textile fabrics.

The training has made many artisans to be self-entrepreneur of their own. Kantha on knitted fabric was developed especially for dress material. Products combining Kantha and Batik were developed for the stoles and sarees. Knowledge on strengthening the market links and networking with resource agencies was also acquired during the course.



# Design Collaboration with Lambani Women for Developing Intricate Handmade Products



Handmade Products by Lambanis

## **Vibrant and Colourful Handmade Products by The Lambanis**

The Lambanis, also known as Banjaras, in other parts of the country are colourful, semi-nomadic tribal people who reside mainly in Southern and Central India. Their clothes are expressive of their exuberance, the entire dress being pieced together with multi-coloured fabric and embellishments.

The Lambanis are known for the colours which they spread wherever they themselves or their products reach. The women of this tribe embroider their traditional dresses using mirrors, coins, shells, pattern darning, cross stitch, patchwork and quilting techniques.

Now, a lot of contemporary products such as bags, cushion covers and bed sheets are being embroidered for markets all over. Some of these intricate handmade products take upto 2-3 weeks of intense dedication and hard work.

In order to keep intact the authenticity of this craft, only Lambani women are employed as embroiderers who thereby create a wide assortment of products in rich designs and vibrant colours.

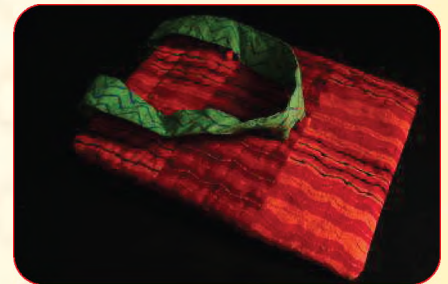
## NIFT Intervention

The artisans (all women) are a nomadic tribal group with inherent skills in their indigenous needlework. The earthy simplicity of their craft combined with their openness to new ideas invited many innovations and design collaborations.



NIFT's work with Lambani women artisans covered product development, colour and

The design strategy was to experiment with both fabric varieties and embellishments in order to create a wide range of products in varied price brackets.



The range included garments (both constructed and unstitched), personal and interior accessories and home furnishings.

Embroidery on silk fabric in suitable product categories brought in higher value realization for the craft worker. The traditional Lambani women who are not able to access silk, were trained in silk embroidery.

Use of locally available cotton fabrics in design development was stepped up to minimize the group's dependence on external sources of fabrics. This could have been problematic for embroidery workers on account of distance, costs and would have increased the cluster level co-operation between producers.

The SHGs have taken up a few trial production orders and delivered good quality products against mutually acceptable orders of cushion covers, sarees, silk stoles, etc. This has also built up their confidence levels to work in their own groups with minimal supervision from NIFT.



# Key Innovations

# COST EFFECTIVE AND FASHIONABLE GADGET FOR SELF DEFENCE

## Type of Innovation: Product

### Objective:

- To provide women with an economically viable and efficient gadget for self-defence.

### Details:

- Jacket inspired by "stun gun" devices, which work on the principle of momentarily shocking the person with a low-voltage pulse.
- It gives a mild electric shock of 110V which is enough to induce a momentary loss of control.
- It surprises the assaulter and deters him from approaching further while giving the wearer time to escape. Thus, helping the wearer to ward off an unsolicited physical contact.
- It has two components – Functional and aesthetic.
- Functional component comprises of operating technology of the jacket which includes circuit and network of wires for delivering shock.
- Circuit is connected with mesh of wires concealed between the outer layer and inner lining. This mesh of wires is connected with metallic rivets on the surface of the jacket.
- A hidden switch activates the circuit, when pressed, delivering the charge to the contact points on the jacket.
- The contact points have been placed at a distance from each other to ensure maximum probability of contact and are camouflaged in the styling of the jacket.
- Aesthetic component comprises of the styling of the jacket.
- It makes the jacket appear like a normal trendy jacket wearing no special appearance but has special features.
- The jacket is also lined with water repellent polymer coated taffeta to protect wearer against electrically charged jacket.
- Weight of the jacket is comparable to that of an 800-850 grams denim jacket.
- Two jackets have been created:
  - One made from traditional knotting technique
  - Other made from regular garmenting technique through the use of panels
- Patent has been filed for it.

### Benefits:

- Provides an additional safety feature to its wearer while maintaining the fashion quotient.
- It is an economically viable product for the safety of women.

### Extent of Adoption:

- Can be utilized by women for their safety while being fashionable.
- The cost of manufacturing this garment is Rs. 1,500.

### Participants:

- Developed by: National Institute of Fashion Technology (NIFT)



# NYCO FABRIC FOR REPLACEMENT OF P/C FABRIC

## Type of Innovation: Product

### Objective:

- To have better durability and comfort than a P/C fabric.
- To fulfil the requirement of combat uniform having lighter weight, abrasion resistance, breathability, flexibility, inherent heat resistance and good moisture management properties.

### Details:

- Currently, paramilitary and military forces use polyester- cotton blended fabric in two compositions, viz. 50/50 and 30/70 for combat clothing.
- Disadvantage of polycot camouflage uniforms is melting of polyester component on skin making burn injury more severe.
- Nylon 66 and cotton blended fabrics in 50:50 ratio (in general known as NYCO) is quite frequently used for military and paramilitary personnel of developed countries.
- Blended NYCO fabric has been developed where nylon adds strength and abrasion resistance, while cotton adds breathability and moisture absorption.
- Nylon 66 fibres procured from INVISTA (Australia) Pty. Ltd. Sanker 6 variety cotton used for blending purpose.
- Yarns were converted into woven fabric using Tsudakoma Zax-N air jet loom (speed 550 r.p.m and width 65 inch).
- Dyeing and printing carried out using vat dyes at M/S Alok Industries Ltd.

### Tests Conducted to Validate its Properties:

- The NYCO and P/C fabric were tested for color fastness, flammability, durability, air permeability, etc.
- In case of NYCO fabric there is no hole formation up to 1,000 cycles while in case of P/C fabric, hole formation is observed at 750 cycles.
- Comfort property is better than P/C fabric as the water vapour permeability and air permeability are higher.
- Flame resistance property of NYCO fabric is better than P/C fabric.

### Benefits:

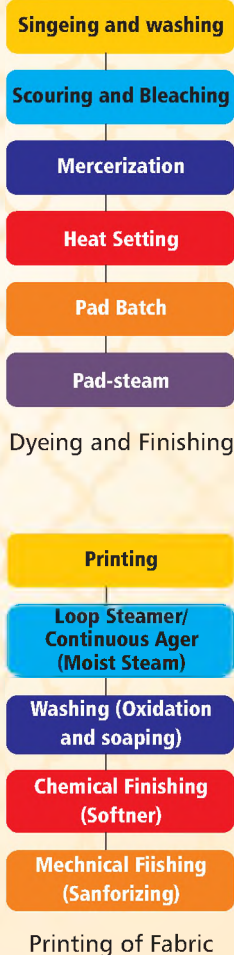
- On exposure to high temperatures, the nylon fibers in fabric form gel and char around cotton that does not melt, so there is less chance of burn injury.
- It provides greater comfort than the P/C fabric.
- NYCO has better flame resistance properties.
- Wear life of NYCO is better than P/C.

### Extent of Adoption:

- Adopted by Para-Military and Military Forces.
- Can be used in other applications where durability and comfort is required.

### Participants:

- Developed by: Northern India Textile Research Association (NITRA)



# SHORT MANUFACTURING PROCESS FOR SEAMLESS GARMENTS USING A LOOM

## Type of Innovation: Process

### Objective:

- To develop a short manufacturing process for producing seamless, self-stitched formal shirts and trousers using a loom.

### Details:

- In existing process, final product is produced by a long process which includes pattern making, grading, marker making and plotting followed by layering, cutting, stitching and finishing.
- Labour oriented and time consuming process which leads to the increase in production cost.
- Short process developed for manufacturing semi-finished and/or finished products using a loom. Any woven product which is stitched from a sheet of fabric can be produced.
- Cutting and sewing process has been eliminated completely.
- Patent has been filed.

### Trials Undertaken:

- Trials were undertaken to check for proper operation of the process and to inspect the final product being manufactured.

### Benefits:

- Less time consuming and cost effective due to elimination of labour intensive cutting and stitching process.
- Absence of dimensional tolerance, etc. unlike prior art process.
- Reduction in conversion cost from yarn to garment.
- Maximizing yarn realization.
- Reduction/elimination of fabric waste.
- Increased strength at joints and main body.
- Value addition at loom stage, resulting in increased earning.
- Less energy intensive, thereby making the process eco-friendly.

### Extent of Adoption:

- Can be used to manufacture low cost readymade garments on loom like pant (half & full), shirt (full sleeve & half sleeve), trousers, pillow cover, cushion cover, etc.
- This process can be adopted on any system, mechanism and machine capable to produce woven fabric.

### Participants:

- Developed by: Northern India Textile Research Association (NITRA)

### Prior Arts

Yarn
Warping
Sizing (Optional)
Drawing-in
Beam Gaiting
Weaving
Transported to Garments Factories
Fabric Inspection
Layering
Cutting
Bundling
Stiching on Sewing Machine
Post Production /Finishing i.e. attaching accessories, washing, creasing etc.

### Short Manufacturing Process

Yarn
Warping
Drawing-in
Beam Gaiting
Pick-density setting
Post Production/Finishing i.e. attaching accessories, washing, creasing etc.



Cotton Shirt



Cotton Trousers

# WATER REPELLENT JUTE GEOTEXTILES WITH NATURAL ECO-FRIENDLY ADDITIVE

## Type of Innovation: Product

### Objective:

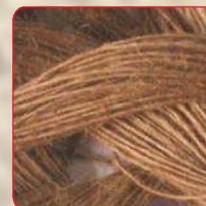
- To identify suitable eco-friendly polymers and natural additives to modify jute geotextiles.
- To develop a process for treating jute fibers and fabrics for manufacturing degradation resistant geotextiles.

### Details:

- Natural jute fibre and fabric is prone to degradation. Treatments available for enhancing tensile strength, hydrophobicity and degradation resistance but these are expensive and toxic.
- For this, jute fibers, yarns and fabrics are treated with reagents prepared by combining a variety of vegetable oils, fatty acid distillates and phenolic resins with anti-microbial properties.
- Jute fibers and fabric are dipped for 24 hours within an aqueous emulsion prepared from sodium hydroxide, plant tannin, cashew nut, resorcinol, neem oil and formaldehyde in 1:10:8:2:6:4 proportion by weight with pH of 8.
- Recovered fibers/fabrics are squeezed mechanically to recover unused reagents and expelled amorphous matter.
- Fibers/fabric are then cured in a convection oven at 105 degree Celsius for 1 hour.



Hand Made Yarn



Machine Made Yarn

### Tests Conducted to Validate its Properties:

- Tensile strength found to increase by 43% and 33% respectively, for handmade and machine made yarn.
- Machine made and hand-made sample retain 60-62% of the initial tensile strength respectively after 90 days in soil burial.
- Samples retain 61% and 74% of the initial tensile strength after 90 days immersion in 3% aqueous solution of NaCl.
- Retain 70%, 80% and 58% of their initial tensile strength in the solutions of pH 4, 7 and 9.

### Trials Undertaken:

- 80 sq.m. of jute geotextiles manufactured in a pilot plant of IJIRA, Kolkata.
- 500 sq.m. of fabric manufactured at Kamarhatty jute mill in India.
- 30 sq.m. of raw jute woven fabric treated in an industrial set up of KE Technical Textiles Pvt. Ltd.
- Industrial treatment done on 3,000 meters of jute geotextiles (700 GSM, 1.63mm thickness).



Industrial Treatment of Jute Geotextiles

### Benefits:

- Increase in the tensile strength of fiber and reduction in water absorption.
- Increase in degradation resistance of fabric which does not produce toxic elements.

### Extent of Adoption:

- Trials are ongoing at Bhagirathi River (River Ganga), Shantipur, West Bengal.
- Treatment cost to be in the range of Rs. 17 to Rs. 19 per sq.m. of 700 g/sq.m. woven jute fabric.
- Number of small scale and medium scale sectors shown interest in manufacturing.

### Participants:

- Developed by: Indian Institute of Technology (IIT), Kharagpur
- Sponsored by: National Jute Board (NJB)



# HYDROPHOBIC TEXTILES WITH PLASMA TECHNOLOGY

## Type of Innovation: Process

### Objective:

- To improve the functional properties of fabrics by the use of plasma treatment.

### Details:

- In the plasma treatment, energetic particles and photons generated in the plasma interact with the substrate surface.
- Four major effects on surfaces normally observed are Surface cleaning, Ablation or etching, Cross-linking of near surface molecules and Modification of surface chemical structure.
- Plasma polymerization done on 100% cotton, 100% polyester & blended fabrics.
- This gives them water repellent and oil repellent properties.
- Cotton fabrics treated for imparting oleophobic properties.
- Other applications of plasma treatment are:
  - Change in wettability - Studying effect of plasma treatment on wettability of polyester and polyester/cotton fabrics.
  - Dyeing - Studying effect of plasma treatment on dyeing ability of fabrics.
  - Functional finishing - Developed multifunctional cotton textiles, which give excellent UV protection, Flame retardancy, Antibacterial and easy care finish.

### Tests Conducted to Validate its Properties:

- Hydrophobicity measured in terms of spray rating and contact angle measurements. The results are below:

### Trials Undertaken:

- Experiments were carried out with plasma enhanced chemical vapour deposition (PECVD) to impart hydrophobic properties.

### Benefits:

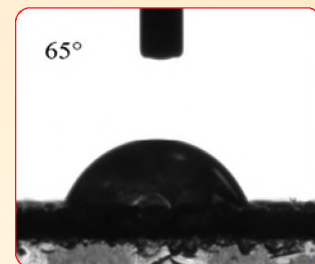
- Clean and dry process for textiles finishing.
- Saves water, electricity and time in dyeing process.
- Less chemical consumption leading to ecological process.
- Plasma preactivation & finishing gave UV protection, flame-retardancy & antibacterial properties.
- The salt and alkali consumption is low which eliminates the issue of total dissolved solids (TDS).

### Extent of Adoption:

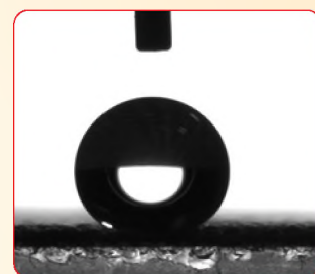
- Commercialization efforts taking place.
- Many companies have shown interest. Pilot plant to showcase technology developed.

### Participants:

- Developed by: Bombay Textile Research Association (BTRA)



Polyester Untreated



Polyester Treated



Type of substrata	Contact angle	Spray rating
Cotton	140°	85
Polyester	150°	100
P/C bland	145°	90
Nylon	135°	80

# NO SALT, LOW ALKALI DYEING OF COTTON TEXTILES WITH REACTIVE DYES

## Type of Innovation: Process

### Objective:

- To develop an appropriate cationizing agent for modification of cotton textiles prior to dyeing with reactive dyes.
- To save water, salt and alkali consumption in dyeing of cotton textiles.
- To reduce the quantity of effluents.

### Details:

- It is an innovation under sustainable textile processing.
- The approach for designing of cationizing macromolecule is:
  - Increasing cationic dye-combining sites in the cationizing molecule for chemical modification of cellulose.
  - Reducing the number of reactive (welding) groups.
  - Considering stereo-chemical aspect for the molecule to be designed, so that the accessibility of anionic dyes to the cationic groups is facilitated for the best dye-fiber interaction.
  - Incorporating a strong penetrant in the system to achieve a deep penetrated chemical modification for all round fastness.
- Indian patent has been filed with Patent Application No. 54/MUM/2013.

### Trials Undertaken:

- Large scale trial undertaken under commercial setup with a 500 m long fabric.
- All large scale trials were taken with no salt and 70% reduction in alkali.

### Benefits:

- The improved process brought 25% saving in water, 70% in alkali and 100% in salt consumption.
- Lower consumption will result in lesser discharge of effluents from industries.
- The lower discharge will result in substantial saving in effluent treatment in the form of Neutralization cost, Power cost, Reduction in Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD) and Total Dissolved Solids (TDS) and Reduced load on reverse osmosis and evaporation
- The process has been granted patent.

### Extent of Adoption:

- The process can be utilized in cotton dyeing applications.
- The cost for application of cationizing chemical by pad comes out to be Rs. 6\* per kg of fabric.

\*Assumptions – Machine: Jigger = 1:4, Fabric weight/linear meter = 200 g/in mtr, 5mtrs per kg of fabric.

### Participants:

- Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)

Savings in Consumption*	Quantity (%)
Water	30,000 l (25%)
Salt	4 Ton (100%)
Alkali	1,400 Kg (70%)


\*For dyeing of 1 lac meter textiles

### Blue Dye:

	Trial	Control
L*	43.21	44.72
a*	-13.67	-14.18
b*	-33.20	-33.64
% R at 420 nm	9.30	9.97

### Red Dye:

	Trial	Control
L*	50.45	52.63
a*	55.17	57.33
b*	8.60	8.27
% R at 420 nm	14.54	16.52



# INNOVATIONS IN PRODUCT

# SPONDY RELIEF GARMENTS

Developed by: National Institute of Fashion Technology (NIFT)

## Need for Innovation:

- To develop garments providing relief to people suffering from spondylitis.

## Details:

- Special garments developed for people suffering from spondylitis.
- Special design to press the important body points and provide relief to the person.
- Garments developed from Spandex and Velcro.

## Benefits:

- Provides relief to the people due to their design.
- Maintain the style and look of clothing.

## Way Forward:

- Can help in providing alternative, stylish clothing for patients.



# REFLEXOLOGY FOOTWEAR

Developed by: National Institute of Fashion Technology (NIFT)

## Need for Innovation:

- To develop footwear providing comfort in walking through a mechanism.

## Details:

- Footwear developed through rack and pinion mechanism.
- It provides perpendicular motion to the nodes, and applies pressure to the foot reflex points.

## Benefits:

- Provides comfort in walking.
- Provide utility of walking with good designs.

## Way Forward:

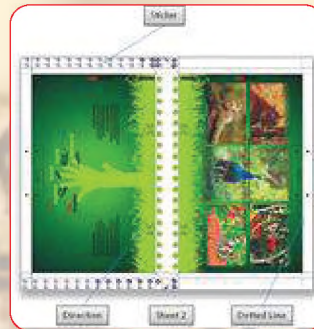
- Can provide a comfortable experience while maintaining the fashion quotient.



# OTHER INNOVATIVE PRACTICES

Developed by: National Institute of Fashion Technology (NIFT)

**Motivating Consumer Towards Sustainable Practices like Conversion of Newspaper into Carry Bag**



**Designing Contemporary Hand Painted Kalamkari Print**



**Study of Thanjavur Paintings Art to Design Innovative Jewelry**



**Handloom Weaving of Meghalaya and Patwa Craft Combined to Create High End Accessories**



**Pyrography in Coconut Shell Craft in Kerala**



# COST EFFECTIVE SOLUTION FOR INDUSTRIAL WORK WEAR

Developed by: Ahmedabad Textile Industry's Research Association (ATIRA) & Jayashree Textiles

## Need for Innovation:

- To fulfil the requirement of heat resistant and comfortable work wear for the employees in industries.
- To reduce the cost of fabric production for industrial work wear.

## Details:

- The work wear developed has significant viscose in blend.
- It has been developed by ATIRA in association with Jayashree Textiles, Kolkata.
- Approved as per ISO 11612:2008.

## Benefits:

- It is comfortable to wear in tropical countries.
- Achieved a 50% reduction in cost of fabric production.

## Way Forward:

- Can be used in oil refineries, airport authorities, metal industry, foundries, etc.



# NANO-FIBRE BASED FACE MASK FOR PROTECTION AGAINST FLU VIRUSES

Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)

## Need for Innovation:

- A normal face mask is not able to give protection against serious flu viruses like Swine Flu, Avian Flu, etc.

## Details:

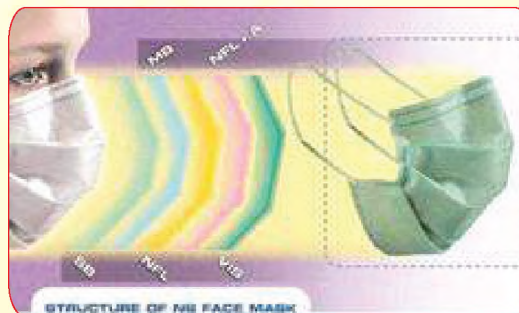
- It is a nano-fiber based product developed specifically for protection against viruses.
- It has a very high filtration efficiency of 99.9%.
- Indian patent for this is under filing process.

## Benefits:

- Mask provides almost 100% protection against flu viruses.

## Way Forward:

- It has been tested at the Nelson Laboratory, USA.
- Adopted by 7 lacs doctors and 15 lacs nurses.



# NANO-FIBRE BASED DUST FILTRATION MEDIA

Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)

## Need for Innovation:

- To develop an efficient filter for the dust coming out of the industries.

## Details:

- Developed by a nanoweb on cellulose substrate.
- Annual requirement of filter media in industrial applications is 3 lacs sq.m.
- Indian Patent has been filed with Application No.: 93/MUM/2012.

## Benefits:

- It is a durable product which requires lesser replacement.
- It is ~20% energy efficient.

## Way Forward:

- It is currently being utilized under industrial set-up.
- Can be used to replace conventional filters in other filter applications.



# NANO-FIBRE BASED CIGARETTE SMOKE FILTER

Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)

## Need for Innovation:

- To minimize the damage of smoking by filtering greater quantity of Tar.

## Details:

- Filter disc developed of Nanoweb.
- It can be attached externally to the cigarette filter.
- Can filter Tar of the cigarette.
- Indian patent is under filling.

## Benefits:

- It filters 40-50% more Tar than a normal filter which results in its less deposition in the lungs.
- It reduces the harm caused by smoking.

## Way Forward:

- Can be used commercially with cigarette smoke filter to reduce the damage to lungs.



# TEXTILES DOPED WITH CONDUCTIVE POLYMER – SMART TEXTILES

Developed by: Bombay Textile Research Association (BTRA)

## Need for Innovation:

- To develop fabrics conducting electricity which can help in heat generation, security application, etc.

## Details:

- Non conductive or less conductive substrate like nylon, cotton, polyester, etc. can be made conductive by deposition of conductive material over them.
- Patent has already been filed.

## Benefits:

- The material starts conducting electricity which can be used in applications like heat generation, occupancy detection, etc.

## Way Forward:

- Finds application in many sectors like mobile, military, etc. Can be used for:
- Occupancy Detection – Smart mat can be utilized in household or restricted areas for detecting intruder entry by generating a signal when a person steps on it.
- Heat Generation - Warming Jacket & Heating Pad. The temperature of pads can be maintained at 40-45 oC. A 24 V rechargeable battery is used as a power source. Can also be used as a thermal therapy.
- Gas sensing – Ammonia and Ethanol Sensors. All commercially available sensors are metal oxide based which require high temperature to sensitize hazardous gases. But conductive fabric substrate can sensitize the reactive gas at room temperature.
- Security Application - Developed a textile system capable of sending a pre-recorded message by one gentle push contact. Most useful in emergency situations such as intruder attack, robbery and several panicking situations. It can be inserted into many innocuous looking objects such as sofa, table cloth, mouse pads, etc. Once trigger is activated, a phone call containing recorded message is made by an electronic circuit to 3 pre-designated numbers.
- EMI Shielding



Security Application



Warming Jacket



Heating Pad



Smart Mat



Ammonia Sensor



# BLENDED FABRIC FROM A NATURAL FIBRE - CORN HUSK AND COTTON/POLYESTER/ ACRYLIC FIBRE

Developed by: Northern India Textile Research Association (NITRA)

## Need for Innovation:

- To develop fabric by utilizing other natural fibres like Corn Husk.

## Details:

- Corn Husk which otherwise is not used in any textile application, is utilized in making fabric.
- Blended fabrics are made of corn husk and other fibre like cotton, polyester, acrylic, etc.

## Benefits:

- Utilization of waste material to produce fabric.
- Cost effective solution.

## Way Forward:

- Can be utilized in many textile applications, ultimately for production of garments.



Corn Husk



Ambar Charks Spinning



Garment

# BARBED BI-DIRECTIONAL SUTURES

Developed by: The South India Textile Research Association (SITRA)

## Need for Innovation:

- To introduce bi-directional barbed surgical suture that does not require surgical knots for wound closure.

## Details:

- Designed and fabricated an equipment to introduce bi-directional barbs into a monofilament suture.
- The barbed sutures subjected to implantation trials in albino rats.
- The tissue holding capacity of barbed sutures is higher than that of conventional sutures by about 35% after 14 days of implantation and 15% after 21 days of implantation.

## Benefits:

- Improved tissue repair as compared to currently available conventional sutures.
- Tying knots are not required which does not lead to any distortion or scar formation.
- Also lesser time is consumed in the process.

## Way Forward:

- Can be used in surgeries to avoid knot breakage/slippage.



Normal Monofilament Suture



Magnified mid-section of a Barbed Suture

# ROTATOR CUFF REPAIR DEVICE FOR SHOULDER RECONSTRUCTION

Developed by: The South India Textile Research Association (SITRA)

## Need for Innovation:

- To develop strong, long lasting shoulder reinforcement material.

## Details:

- Embroidered polyester cuff reinforcement developed for reconstruction of shoulder.
- Cuff made from polyester filament yarn.

## Benefits:

- High biocompatibility and resistance to action of the tissue environment for longer periods.
- Embroidered construction provides good visibility of the underlying anatomy during keyhole procedures without compromising on the mechanical properties.
- The porous character of mesh allows tissue infiltration to incorporate prosthesis.

## Way Forward:

- Being used in shoulder construction procedures.



# SPECIALITY 3D COMPRESSION BANDAGES FOR LYMPHEDEMA

Developed by: The South India Textile Research Association (SITRA)

## Need for Innovation:

- To improve the elastic recovery and dimensional stability of the bandage.
- Structure of the padding bandage may collapse due to pressure applied by compression bandage, thereby not imparting a cushioning effect to the limb.

## Details:

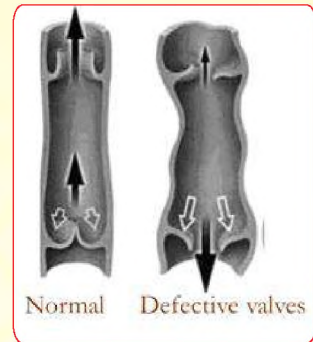
- Single layer (integrated) compression bandage developed.
- 3D warp knitted spacer fabrics utilized for developing.

## Benefits:

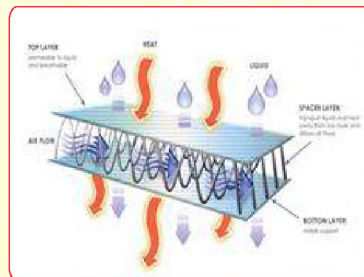
- Reduces duration of compression therapy.
- Better crease recovery & slippage resistance than conventional crepe bandage.
- Comforting & climate controlling effect.
- Excellent cushioning effect and good thermal conductivity.

## Way Forward:

- To be used for treatment of lymphedema.



Stage 1: Considered Reversible



Stage 2 and 3: Irreversible

# LOW COST PRINTING THICKENERS FROM NATURAL SOURCES

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To develop cheaper printing thickeners for the textile processing industry.

## Details:

- Synthetic thickeners used in printing but they prove to be expensive for many textile printing units.
- Alternative printing thickeners developed from guar seeds and tamarind kernels.
- Guar seeds given hydrolysis treatment followed by chemical modification.
- Tamarind seeds given hydrolysis and oxidation treatment to produce thickener.



Gaur Seeds



Tamarind Kernels

## Benefits:

- Cheaper alternative for printing thickeners.
- High rate of adoption by textile units.

## Way Forward:

- The technology adopted by many local processing units in Surat.

# ECO-FRIENDLY STAIN REMOVER AS A REPLACEMENT FOR CARBON TETRA CHLORIDE (CTC)

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To develop an eco-friendly and safe stain remover as an alternative to Carbon Tetra Chloride (CTC).

## Details:

- Volatile Organic Compound (VOC) emission norms and worldwide ban put on the use of CTC.
- Stain remover developed for the textile industry as an alternative to CTC.
- It is named as MANTRA CTC Substitute Product.

## Benefits:

- It is an eco-friendly product.
- Relatively safe for human health and has good functional performance.

## Way Forward:

- It has proved to be a successful alternative to CTC.

# COMPUTER COLOUR MATCHING SYSTEM

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To develop a system for accurate and consistent matching of colors.

## Details:

- Computer colour matching system developed for textile applications.
- A computer colour matching software also developed in collaboration with a local IT firm.
- Software called 'Kothari Colorist', a match prediction software, developed to eliminate the colour matching problems of the industry.
- It works in conjugation with a spectrophotometer. Target colour is read using the spectrophotometer and the recipe based on the stock colours is predicted.

## Benefits:

- Accurate matching of the colors to get consistent results with insignificant variations.

## Way Forward:

- Software has been marketed commercially and is being used by leading textile and paint manufacturers.



# ECO-FRIENDLY TECHNICAL TEXTILES FROM BANANA YARN

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To manufacture biodegradable and eco-friendly technical textiles from banana yarn.

## Details:

- Developed window curtain blinds from banana yarn.
- Developed by chemical finishing, coating and lamination of banana yarn.
- Other technical textile products also developed such as fancy shoes (Mojdi), jackets, composite boards, etc.

## Benefits:

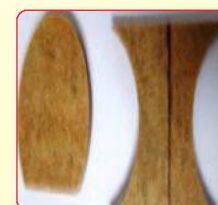
- Eco-friendly technical textile products have been developed.
- They are light weight as well as biodegradable, useful for automobile.

## Way Forward:

- Developed samples have been well received by entrepreneurs.
- Large scale sampling is in progress.
- Can act as a substitute to cotton to some extent.



Fancy Shoes (Mojdi)



Composite from Banana and Polyester Resin

# WOVEN PACKAGING BAGS OF POLY LACTIC ACID (PLA)

**Developed by: Man-Made Textiles Research Association (MANTRA)**

## **Need for Innovation:**

- To manufacture biodegradable and recyclable packaging material.

## **Details:**

- Woven bags of Poly Lactic Acid prepared for packaging of non-perishable, powdered/granular food products such as sugar, tea, coffee, etc.
- PLA is a natural based value added polyester fibre.
- Bag made in the packaging sizes of 1 kg, 2 kg and 5 kg.
- Comply with the BIS specifications.

## **Benefits:**

- It is as durable as other natural fibres like, cotton, wool, silk, etc.
- It has hydrophilic properties and is biodegradable.

## **Way Forward:**

- Can be a good replacement for synthetic food packaging material.
- Some technical textile manufacturers have been shown the products and discussions are underway for improvisation and commercialization.



# FIRE RETARDANT JUTE FABRIC

**Developed by: Institute of Jute Technology (IJT)**

**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To impart fire retardant property on jute fabric for specific application areas.

## **Details:**

- Four formulations (two non-durable and two semi-durable) of fire retardant finish on jute have been developed.
- One durable fire retardant finish formulation on jute is standardized and Limiting Oxygen Index (LOI) achieved is 38 without wash and 35 after wash.

## **Benefits:**

- Fire retardant jute fabric has been developed.

## **Way Forward:**

- Trials conducted at Reliance Jute Mill, West Bengal.



# MANUFACTURE OF JUTE BRAIDED CLOTH BY APPROPRIATE DESIGN INCORPORATION ON BRAIDING MACHINES

Developed by: Indian Jute Industries Research Association (IJIRA)

Sponsored by: National Jute Board (NJB)

## Need for Innovation:

- To explore the newer application areas of jute diversified products.
- To meet the rising demands of saplings in horticulture/ forestry/ agro-forestry nurseries.

## Details:

- Manufacturing of jute circular braided cloth on a braiding machine.
- Manufacturing of jute braided sleeves of different flat widths (up to 15 cm), covers and constructions.
- Optimizing the structures and dimensions of jute braided cloth according to end use requirements.

## Benefits:

- Jute braided sapling bags enhanced soil nutrient level by enriching the soil with organic carbon, phosphorus and potassium.
- Jute braided sapling bags performed much better than polybags in respect of soil loss from bags during nursery care.

## Way Forward:

- Field trials carried out at Agri-Horticultural Society of India, Kolkata.



Jute Braiding Machine



Jute Braided Bag



Field Trails



Roots have come out through the openings of jute braided sapling bag

# NATURAL RUBBER COATED JUTE FABRICS FOR NOVEL END USES

Developed by: Indian Institute of Technology (IIT), Kharagpur  
Sponsored by: National Jute Board (NJB)

## Need for Innovation:

- To replace the HDPE/LDPE lamination of jute fabric with natural rubber coating.

## Details:

- Composition of the rubber coating has been optimized.
- The entire process for development of natural rubber coating on jute fabric has been optimized.
- All the process parameters have been optimized as well.

## Benefits:

- Natural rubber coating with jute makes it perfectly eco-friendly product for novelty application areas.
- The coated jute fabric becomes odourless, water repellent and non-sticky.

## Way Forward:

- Trials for production of rubber coated jute fabric have been conducted at KE Tex, Kharagpur.

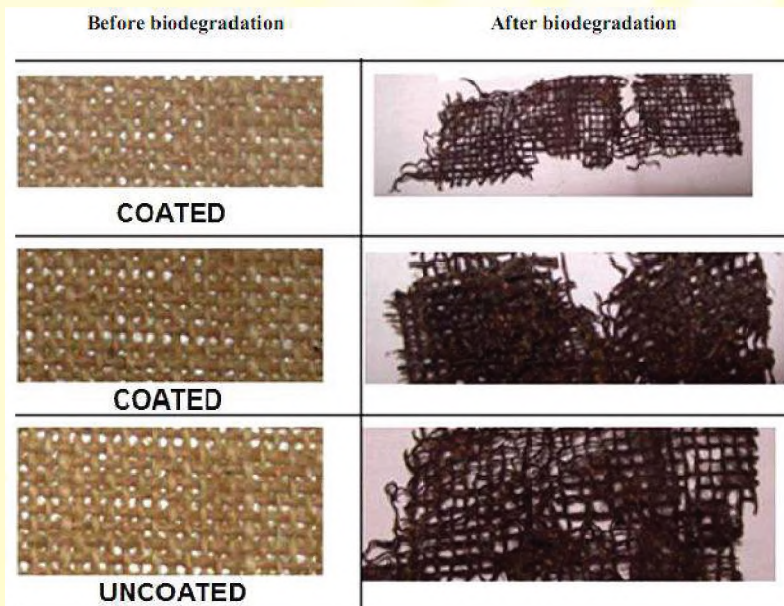


Raw Jute Fabric



Coated Jute Fabric

Rubber Coated Jute Samples



Metallized Film Coated Fabric



Hot Stamping



# LOW COST, DENSE, JUTE NON-WOVEN FABRIC

**Developed by: National Institute of Research on Jute & Allied Fibre Technology (NIRJAFT)**

**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop jute non-woven fabric for its application in different areas.

## **Details:**

- Engineered dense jute nonwoven fabric.
- Density increased by various ways e.g. application of adhesive, application of pressure, by sandwich blending, by application of reinforcing fabric, etc.
- Suitable for geo environmental and agricultural purposes.

## **Benefits:**

- Jute non-woven can be used to cater to niche market for gift bags, in medical waste disposal, mulching cloth, etc.
- It is a cost effective and biodegradable product.

## **Way Forward:**

- Trials conducted with non-woven mulching cloth at:
  - Krishi Vigyan Kendra, Nadia
  - Central Institute of Post-Harvest Engineering and Technology, Abohar, Punjab.



Heat Resistant Tomato Cultivated by Jute Mulching



Tomato Before Harvesting



Light Weight Carry Bag



Jute Nonwoven Horticultural Pot



Jute Nonwoven Mulching

# JUTE AND JUTE BLENDED YARN AND FABRICS FOR HOME TEXTILES/SECONDARY APPARELS AND OTHER JUTE DIVERSIFIED PRODUCTS

**Developed by: South India Textile Research Association (SITRA)**

**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To explore jute fibre in combination with various available manmade fibres for novelty in application areas.

## **Details:**

- Different blends of jute have been developed like:
  - Jute/viscose
  - Jute/polyester
  - Jute/acrylic

## **Benefits:**

- Newer application areas of Jute and its blend with other fibres have been identified for manufacture of home textiles, secondary apparels, etc.

## **Way Forward:**

- Trials have been conducted at Gloster Jute Mill, Howrah.



Carpet made from Jute Blended Yarn



Jute/Polyester Blended Sliver

# SUITABLE OVERLAY FABRIC TO SERVE AS A CHEAPER SUBSTITUTE OF BITUMEN MASTIC

**Developed by: Institute of Jute Technology (IJT)**

**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop suitable overlay fabric of jute to be used as a substitute of Bitumen Mastic for road construction.

## **Details:**

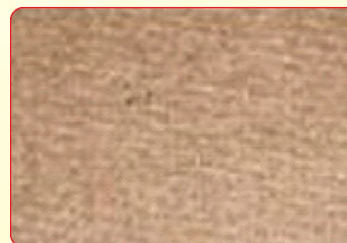
- Developed an innovative jute paving fabric with a combination of woven and nonwoven jute fabric.
- This is followed by bitumen treatment of suitable type and grade.
- Aimed at reducing the cost of road construction.

## **Benefits:**

- New application areas of jute geotextiles in road construction.
- It is a cost effective substitute to Bitumen Mastic.

## **Way Forward:**

- Applied on road in Kolkata and under observation.
- Can find usage in other geotextile applications.



Grey Jute Paving Fabric

# NATURAL DYES ON JUTE BASED TEXTILES

**Developed by: Institute of Jute Technology (IJT)**  
**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop eco-friendly natural dyes on jute fabric for value addition.

## **Details:**

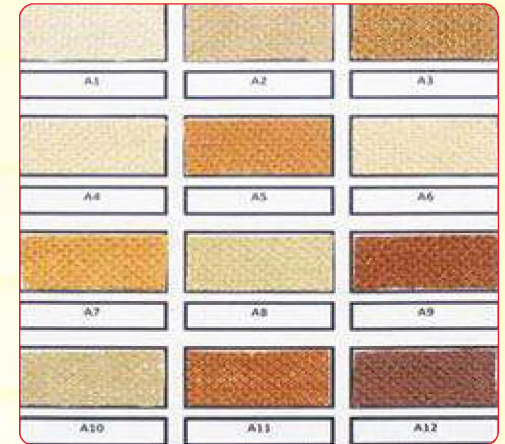
- Identified suitable natural dyes for dyeing of jute based products.
- Standardized the methodologies of application of natural dyes on jute substrate.
- Different pairs of natural dyes made compatible to be applied in mixtures.
- Improved the dyeing ability and colour fastness behaviour by chemical pre-treatments and post treatments.

## **Benefits:**

- Can cater to the requirement of the export market.
- Natural dyes are not harmful and non-carcinogenic.
- They are non-allergic and hazard free for skin.

## **Way Forward:**

- Trials conducted in Asim Kar and Industries, Kolkata.



Jute Fabric Dyed with Tesu

# PREFABRICATED VERTICAL JUTE DRAIN (PVJD)

**Developed by: Indian Jute Industries Research Association (IJIRA)**  
**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To accelerate the soil consolidation by discharging pore water from ground.
- To increase the bearing capacity of foundation.

## **Details:**

- Project undertaken by NJB in association with IJIRA.
- Developed a jute geotextile product.

## **Benefits:**

- Cost effective and suitable solution for increasing the soil consolidation.
- Help in strengthening the foundation for better load bearing capacity.

## **Way Forward:**

- Field trial of 40,000 linear meter of PVJD is currently underway in collaboration with University of Wollongong, Australia.



# JUTE / BAMBOO COMPOSITES FOR APPLICATION IN RURAL AREAS

Developed by: Indian Jute Industries Research Association (IJIRA)

Sponsored by: National Jute Board (NJB)

## Need for Innovation:

- To develop hard composite board of Jute/Bamboo as a substitute of plywood for its usage in rural areas.
- To develop composite materials for rural application (building components, transport sector, structural, packaging, furniture, etc.)

## Details:

- Developed jute/bamboo hybrid composites in the form of board.
- Different fibers of jute and bamboo are incorporated into a single matrix to develop the composite.
- Jute in the form of non-woven and bamboo in the form of mat have been chosen as reinforcing fibre component and hydrophilic water soluble phenol formaldehyde resin has been chosen as matrix binder.

## Benefits:

- They are very cost effective.
- The composites are light weight and are eco-friendly.
- They become water resistant due to the application of phenol formaldehyde.

## Way Forward:

- Application in various areas including modular housing, panels, interior, floor tiles, etc.
- High potential in domestic and export market as building material, furniture, flooring, etc.



Jute Bamboo Composite Board



Jute Bamboo Composite Sandwich Panel



Jute Bamboo Composite Board

# JUTE FIBRE REINFORCED CEMENT CONCRETE (RCC)

**Developed by: Indian Institute of Technology (IIT), Kharagpur**  
**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop application of jute fibre in RCC to be used for precast non-pressure (NP) sewerage pipes, pre-stressed electric poles and pavers block.

## **Details:**

- Jute fiber modified with alkali and other chemical constituents.
- This is mixed with cement to prepare slurry.
- The slurry is mixed properly and it is put into the mould to prepare the end product.

## **Benefits:**

- With the application of jute in RCC, the steel content is reduced to 30% in case of NP3/NP4 pipes.
- Asbestos fibre is partially replaced with jute in corrugated asbestos sheets.
- It forms a low cost and durable product.
- Water absorption of jute and its degradation is reduced.

## **Way Forward:**

- Trials are ongoing at Ramco Industries.
- Industrial trial for fabrication of paver tiles and testing performed at M/S Rural Concreting Company of Ghatal Pvt. Ltd.
- Can be used in jute reinforced roofing sheet, brick wall plastering, etc.



Jute Concrete Pipe



Pre-stressed Concrete Pole



Jute Cement Fly Ash Sheet Composite



Paver Tiles

# ECO-FRIENDLY / BIO-DEGRADABLE RIGID JUTE BASED COMPOSITES

**Developed by: Indian Institute of Technology (IIT), Kharagpur**  
**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop newer application areas of jute fibre.
- To develop completely biodegradable jute composites and to identify its suitable applications.

## **Details:**

- Composite developed of jute and bio-resin like soy protein concentrate (SPC), soy protein isolates (SPI) and soy oil.
- Jute fiber modified for better bonding.
- Aldehydes like formaldehyde, glutaraldehyde, glyoxal, furfuraldehyde used as crosslinking agents.

## **Benefits:**

- These are completely bio-degradable as compared to polymer composites.
- These exhibit high tensile strength.
- The resultant composite has hydrophobic properties also.

## **Way Forward:**

- Rigid biodegradable jute composite panels which can be used in office cubicles, interior furniture, computer cabinets, etc.
- Usage in preparing biodegradable sampling pots.
- Industrial collaboration being carried out for product commercialization with:
  - Indrasen Shamlal Ltd. for biodegradable sapling pots.
  - Synthetic Moulders Ltd. for jute composite panels.



Jute Composite Panel



Sapling Pots

# SOUND PROOFING COMPOSITE MATERIALS USING JUTE PRODUCTS

Developed by: Indian Institute of Technology (IIT), Kharagpur  
Sponsored by: National Jute Board (NJB)

## Need for Innovation:

- To develop sound proofing composite material using jute products by exploring newer application areas of jute fibre.

## Details:

- Jute felt modified chemically to make it suitable for the application.
- Treated with alkali and then dried to remove impurities.
- It is then treated with natural rubber solution.
- Composite prepared by pressing ten pieces of jute felt with a press.



Natural Rubber Latex Jute Composite

## Benefits:

- Application of jute as sound proof composite materials.
- It absorbs less of water.
- It has excellent fire retardant properties.

## Way Forward:

- Bulk trials conducted at IFB, Goa and Israil Plywood.
- The process feasibility of jute composite is high in vacuum cleaner, domestic dryer and acoustic ceiling.



Jute Fiber Panels



Jute Blanket

# COTTON LAP/ CELLULOSE PAD SUBSTITUTE FROM JUTE

**Developed by: Indian Institute of Technology (IIT), Kharagpur**  
**Sponsored by: National Jute Board (NJB)**

## **Need for Innovation:**

- To develop jute based cellulose laps having high fluid absorbency for baby diapers, sanitary napkins, gauze, wound dressing material, etc.

## **Details:**

- Developed jute based cellulose laps having high fluid absorbency.
- Developed the process of blending various super absorbent polymers (SAP) along with jute based cellulose laps.
- Cellulosic fiber recovered from caddice by chemical treatment to be used as substitute of cotton cellulose for absorbent materials.

## **Benefits:**

- Cost effective and suitable for rural market.
- Available in plenty in Bengal region.

## **Way Forward:**

- SAP and processed cellulose from jute have been prepared for supply to Baliagram Unnayan Samity, an NGO. It will prepare sanitary napkins and distribute to the users for testing.
- M/S DiponEd BioIntelligence has approached and showed interest for taking the technology of diaper materials.



Diapers



Gender Hygiene Product



Surgical Cotton



# INTERNET BASED COLOUR MATCHING FACILITY FOR SMALL AND MEDIUM DYE HOUSES

Developed by: Wool Research Association (WRA)

## Need for Innovation:

- To develop information linked programme to serve dye houses and to save cost in the decentralized sector.
- To provide 24x7 instant colour matching solutions (ICS) for any time matching (ATM) and formulation of recipes (FOR).
- To upgrade dyeing technology at affordable level to small operators in remote areas on continual basis.

## Details:

- Developed WRACOLOURMATCH service which includes formulation and quality control.
- Contains 11 database files with 101 dyes and three substrate: Wool top, PET top and Wool blanket.
- WRA Experts regularly verifying the databank to increase field accuracy.
- Can get instant recipe for any shade, anytime and anywhere if provided with portable spectrophotometer.

## Benefits:

- Easy to use and cost effective service.
- It is available 24x7 through online channel.
- Includes both formulation and quality control features.

## Way Forward:

- Organized several workshops and training programs to upgrade dyeing technology like in Raymond: Vapi, OCM: Amritsar, JCT Limited: Phagwara, etc.
- Providing colour matching service to users with affordable spectrophotometer and minimum annual charges.



# ITCH FREE WOOLLENS

Developed by: Wool Research Association (WRA)

## Need for Innovation:

- To develop itch free woollens to be worn next to the skin to prevent the itching sensation caused by wool.

## Details:

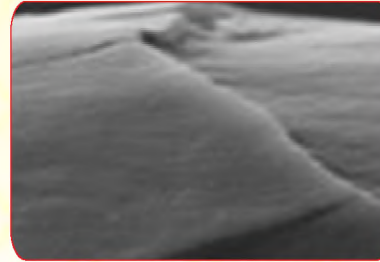
- Improving the surface topography of the wool fibres with the help of mechanical/chemical processing and plasma technology.
- Hairiness reduced by using singeing and surface scale made blunt by using plasma technology in fiber/fabric stage.
- The resultant fiber/fabric softened by using enzyme/softeners treatment.
- Polymer coating/grafting to mask the wool fiber surface scales.
- Patent is in progress.

## Benefits:

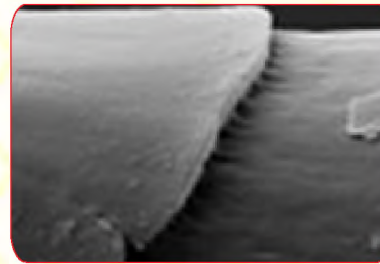
- Eco-friendly processing using Plasma and Enzyme Technology.
- Plasma treated yarn shown 10% increase in yarn strength as well as breaking elongation.
- Thermal resistance of plasma treated fabric was increased.
- Plasma treatment assists the enzyme treatment.

## Way Forward:

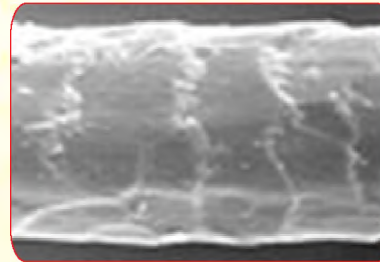
- Trials are being done with the innovation being presented at one international conference and two national conferences.



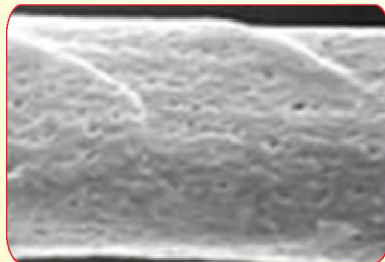
Untreated Wool Fiber



15mins Plasma Treated



5% Enzyme Treated



Plasma + 5% Enzyme Treated

# MOTH PROOF WOOL DYES

**Developed by: Wool Research Association (WRA)**

## **Need for Innovation:**

- To prepare cost effective synthetic wool dyes with the incorporation of moth proofing reactive groups.

## **Details:**

- Organic synthesis routes to combine insecticidal activities (mainly Moth proofing) with coloring groups to produce dyes with inherent insect proofing properties.
- Amino benzyl propyl ethers and Amino benzyl ethers have been synthesized, diazotized and coupled with coupling compounds to yield different dyes.

## **Benefits:**

- Improve moth resistant properties of woolen garments.
- Inbuilt moth proofing character provides cost benefit as the Mitins, Eulans and synthetic pyrethroid formulations imported turn out to be costly.
- Improve the fastness properties of wool.

## **Way Forward:**

- Patent is in progress.



Wool Fabric Samples 14 days after Exposure to Larval Feeding



Moth



Moth Affected Wool

# COARSE INDIAN WOOL COMPOSITES

**Developed by: Wool Research Association (WRA)**

## **Need for Innovation:**

- To use short and coarse wool fibres like Deccani at fiber stage and yarn stage in producing composite materials for value added products.

## **Details:**

- Coarse wool has lesser utility as it cannot be converted into useful yarn on the spinning machine.
- Consolidation of fibers using compression technique to convert web into felt form.
- Needle punching of the fibres to provide consolidated web for further treatment.
- Lamination done using various polymers.

## **Benefits:**

- Composites developed with application in many areas.
- Reduces the wastage of coarse wool.

## **Way Forward:**

- Different products developed from the composites like:
  - Electrical Boards
  - Door Panel
  - Electrical Insulation Mats
  - False Ceiling
  - Vibration Damping Mats



Electrical Boards



Door Panel



Electrical Insulation Mats



Vibration Damping Mats

# ODOUR-LESS AND ANTIMICROBIAL WOOLLEN CARPETS

Developed by: Wool Research Association (WRA)

## Need for Innovation:

- To develop woollen carpets with fresh feel and which have antimicrobial properties.

## Details:

- Antimicrobial finishes prepared and applied on carpet yarn.
- Silver nano-particles prepared and applied to give antimicrobial properties.
- Natural essential oils applied in vapor form on carpets.
- Citronella oil found to be the best natural essential oil.

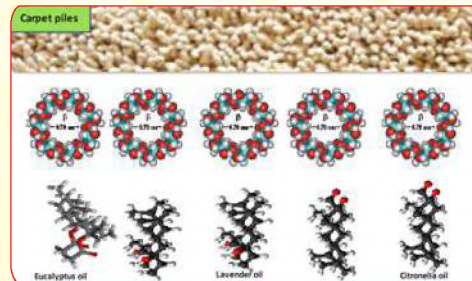
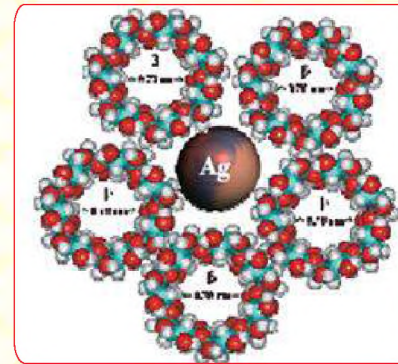
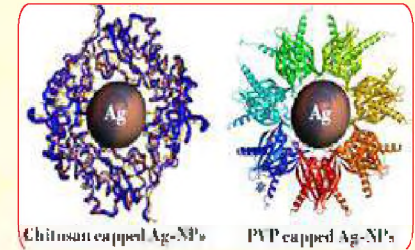
## Benefits:

- 99.99% antimicrobial properties given to carpets.
- The carpets become free from any odour.

## Way Forward:

- Antimicrobial and odour free carpets can be used in furnishing of homes.

Antimicrobial Finishes



Perfume Vapour Deposition on Carpet Samples

# SUPER ABSORBENT POLYMER FIBER MATS

Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

## Need for Innovation:

- To develop a superabsorbent polymer mat for horticulture activities.

## Details:

- Super absorbent polymers (SAP) used with fibre mats.
- Two types of SAP can be used:
  - Natural – Polysaccharide based
  - Synthetic – Polyacrylamide based
- Polyacrylamide based SAP found most suitable.
- SAPs used in the agriculture are polyelectrolyte gels often composed of acrylamide (AM), acrylic acid (AA) and potassium acrylate.

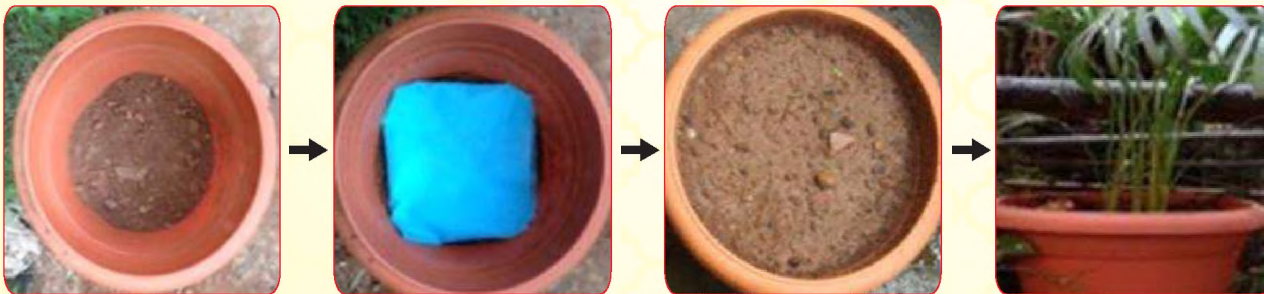
## Benefits:

- High water retention which can be used for horticulture applications in areas of less rainfall.
- Positive influence on the growth and development of the plant.
- Reduces water consumption by the plant by reducing water frequency.

## Way Forward:

- Trials are being done with the innovation being presented at one international conference and two national conferences.

Laying of Pot with Super Absorbent Polymer Mat



# UV FLUORESCENT YARN TO DETECT COUNTERFEITS

Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

## Need for Innovation:

- To create a unique method for tagging and identifying legitimate agrotextile items using fluorescing nanoparticles into yarns.

## Details:

- Duplication and availability of counterfeit products is a big problem in agrotextile sector.
- To address this, a unique method of tagging has been proposed using fluorescing nanoparticles.
- Various fluorescent pigments have been identified. These are combined with polymer batch and combined spinning is done to produce anti-counterfeit yarns.

## Benefits:

- Help in clear identification of manufacturer's products, thereby preventing counterfeiting.
- It is a cost effective process.

## Way Forward:

- It can address the problem of counterfeiting in agrotextile sector.
- The concept can later be extended to other textiles and garments.



Polymer Master Batch



UV Fluorescent Pigments



Anti-Counterfeit Yarns

# TEXTILE BASED BIOMAT TO COMBAT OIL SPILLS

Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

## Need for Innovation:

- To develop textile based mats for combating pollution problems generated due to oil spills.

## Details:

- A uniquely designed bio mat with textile non-woven sewn together.
- Combination of a non-woven fabric with lignite powder and inner coating with a consortium of microorganisms which can degrade the oil to basic compounds.

## Benefits:

- Used to absorb and degrade oil spillage.
- The mat is reusable once bacteria degrade the oil.

## Way Forward:

- They can combat oil spillage in the textile and general industries.



Testing the Bio mat  
Tray with 1 litre water and 50 ml oil



Absorption of Oil within 10 mins

# ELECTRICALLY CONDUCTIVE PET-CNT NANOCOMPOSITE FILM

Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

## Need for Innovation:

- To develop an electrically conductive film from polymer matrix having the capacity to resist electromagnetic radiations.

## Details:

- A PET matrix is developed by identifying the grade of polyester to be mixed.
- Carbon Nano Tubes (CNTs) are then incorporated in the polymer matrix.
- Ultrasonicator equipment used for solution mixing.

## Benefits:

- The electrical conductivity of the matrix increases.

## Way Forward:

- These films find very promising use as electromagnetic shielding films.
- Finds application in smart textiles.



# PRODUCTS FOR SILKWORM REARING AND MULBERRY CULTIVATION

Developed by: Central Sericultural Research and Training Institute

## Need for Innovation:

- To develop a superabsorbent polymer mat for horticulture activities.

## Ankush:

- Eco-friendly, user friendly and cost effective silkworm body and rearing bed disinfectant effective in preventing the spread of all silkworm diseases during silkworm rearing.
- Trials have revealed that use of the product has reduced spread of pebrine by 65.62%, Grasserie by 70.90%, Flacherie by 79.17% and Muscardine by 96.50 %.
- The product has been commercialized.

## Asthra:

- The major infectious diseases during silkworm rearing are Grasserie, Flacherie, Muscardine and Pebrine.
- Several reports have estimated the crop loss due to these diseases from 15% – 45%. A loss of Rs. 3.5 crores due to muscardine, loss of over Rs. 200 crores due to pebrine has been reported.
- Asthra is a disinfectant spray, which is germicidal against all silkworm pathogens.
- It is a low cost formulation that is easy to handle and transport and highly soluble in water. It is effective at low doses, under all environmental conditions and less corrosive at recommended concentration.
- The cost benefit ratio is 1: 9.78 while the product has a long shelf life of one year.

## Poshan:

- Nutrient deficiency in mulberry frequently encountered due to inadequate availability of macro and micro-nutrients.
- To give a good yield Poshan has been developed. It is a multi-nutrient foliar spray along with growth promoters developed for correcting nutrient deficiencies in mulberry.
- The foliar spray ensures rapid utilization of nutrients and recovery from nutrient deficiency in a cost effective way.
- Cost benefit analysis is 1:7.
- Trials show an increase in leaf quality and yield up to 15-20%.
- The product has been commercialized through two entrepreneurs.



### **Nemahari:**

- Plant based product for management of root knot disease of mulberry caused by the nematode *Meloidogyne incognita* (Kofoid & White) Chitwood.
- Root knot is a serious disease of mulberry, which reduces 20% leaf yield besides affecting leaf quality especially protein.
- Use of chemicals to control the nematodes is expensive and repeated application destroys beneficial microbes in soils.
- Nemahari consists of 75% plant derived components and 25% chemicals is applied at the rate of 40 kg/ha.
- It is target specific, eco-friendly plant based formulation and does not affect beneficial microflora in soil.
- It is absorbed by the roots easily and inhibits nematode population and its multiplication in soil and mulberry roots.
- The shelf life of formulation is two years, which is two times more compared to existing technology.
- Field trials have shown a reduction of disease severity by 82%-84%, preventing leaf yield losses of up to 22%-24 %, with a cost to benefit ratio of 1:2.2.



# IT ENABLED INNOVATIONS IN VARIOUS ASSOCIATIONS

Developed by: Ministry of Textiles

## 1. Technical Textiles Sector

- Launching of exclusive websites.
  - [www.technotex.gov.in](http://www.technotex.gov.in)
  - <http://www.technicaltextile.gov.in>
- Websites broadly cover the highlights of Domestic/International Industry along with details of schemes, Baseline Survey, Events, Publications, Investors Guide, List of Exporters/Importers, etc.

## 2. Textile Committee

- Installation of Laboratory Information Management Systems (LIMS)
  - System is implemented in headquarters & more than 16,000 samples are registered through the system so far.
  - Provides automation of work flow, integration of sub processes & facilitate management in the laboratory.
  - Efforts are underway to rollout the system in all regional labs in near future.

## 3. Cotton Corporation of India

- ERP is implemented in Corporation since 1st November, 2011.
  - It covers entire functional activities like Procurement, Sales & Distribution, Materials Management, Finance, HR, etc.
  - Head office and branches are integrated through the database along with WAN.
  - The system will enhance overall efficiency, transparency and response time of all its functional activities.
  - ERP implementation may be taken up to procurement centers level in future.
- Development of new website [www.cotcorp.gov.in](http://www.cotcorp.gov.in) launched on 10th Jan, 2012.
  - Compliant with Guidelines of Indian Government Website (GIGW).
  - Details of daily sale quotes, tenders, auctions, awards, press releases, recruitments, journals etc. are being published regularly.
- Corporation has started sale of its F.P. Bales (Finished Goods) stock through e-auction w.e.f. April, 2013. Approximately 40 parties are already registered for the purchase. The new system improves competitiveness among buyers and maintains full transparency.

## 4. Central Silk Board (CSB)

- Silk Mark Fusion Label and SMS Authentication - Mobile based authentication of label to the consumers for ascertaining the authenticity of the source of silk.
- Silk Flash - Silk prices and its movements in major markets are flashed on CSB websites to help farmers in realizing better price.
- Kisan Call Centers - Integration of CSB information centre to kisan centers enable the farmers & other stakeholders to get the information on silk through a toll free number.
- Silk Web portal - Web portal on sericulture information and knowledge system is developed by capturing geographical images through satellite and these are used for analysis and selection of potential unutilized land for promoting sericulture.

- E-office – It is in implementation stage and has been installed for tracking the movement of files/receipts for better management.

## 5. Office of Textile Commissioner

- Online Registration of Technical Textiles Units - System to have provision of online submission of an application regarding registration of technical textiles units for availing 10% capital subsidy under TUFS. System is under implementation.
- “Users’ corner” on TxC website - User corner will be created on TxC website to invite feedback of stakeholders for further improvement.

## 6. Ministry of Textiles

- Implementation of e-Office - Various modules like File/Receipt Tracking, Knowledge Management System (KMS) and e-Leave are implemented since 4th Sep, 2012.
- Website (www.ministry of textiles.gov.in) - For online dissemination of information to the trade/industry, Details of schemes in various sectors along with its progress, Acts/Notifications, Press releases, Highlights of events, Tenders are regularly maintained on the website.
- Office Automation - Process of coordination among various sections for getting online reply on various references on important subject being automated. System is under development and will be taken up for implementation soon.

## 7. Apparel Training and Design Centre (ATDC)


- Pragati - Implementation of Pragati which is an ERP system installed for real time monitoring and livescreening of the data.
- Digital Content Development – Introduced smart methodology of teaching by introducing digital contents. DVD copies were also circulated. Soft skills training also available in digital contents. The soft skills courses have been implemented in 15 centers in Hindi.

## 8. Institute of Apparel Management (IAM)

- Skype Interviews and Interactions - Adapted to the new technology and included this innovative method in the selection process for admissions. The candidates who applied for the admission for the academic year 2013-14, appeared for the Skype interview with the faculty members and the management at IAM.
- Apps - Developed an App which helps students to connect, learn and interact with faculty and fellow mates.

## 9. Export Promotion Council for Handicrafts (EPCH)

- Web based voting for election of committee member - Web based voting gives voters the choice of casting his/her vote from remote places and at any time convenient to him/her.
- Web enabled services to members - Various web services have been provided to the members including login/user id password facility, online application for membership, facility to create home page on EPCH website, etc.
- Nemahari consists of 75% plant derived components and 25% chemicals is applied at the rate of 40 kg/ha.
- It is target specific, eco-friendly plant based formulation and does not affect beneficial microflora in soil.
- It is absorbed by the roots easily and inhibits nematode population and its multiplication in soil and mulberry roots.
- The shelf life of formulation is two years, which is two times more compared to existing technology.
- Field trials have shown a reduction of disease severity by 82%-84%, preventing leaf yield losses of up to 22%-24 %, with a cost to benefit ratio of 1:2.2.



# INNOVATIONS IN PROCESS

# ENZYMATIC PREPARATORY OF COTTON TEXTILES

**Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)**

## Need for Innovation:

- To save water, caustic soda, peroxide and peroxide stabilizer consumption in preparation of cotton textiles.
- To reduce the discharge of pollutants from industries.

## Details:

- It is an innovation under sustainable textile processing.
- The process has been modified to make it efficient with lesser input requirement.
- Indian Patent has been filed with application number 5083/CHE/2012.

## Benefits:

- Reduced usage of water, caustic soda, peroxide and peroxide stabilizer.
- The reduced consumption will decrease pollutants.

## Way Forward:

- To be used in preparation of RFD cotton fabric.

Savings in Consumption*	Quantity (%)
Water	(20%)
Caustic Soda	700 Kg (80%)
Peroxide	500 Kg (40%)
Peroxide Stabilizer	100 Kg (40%)

\*For preparation of 1 lac meter Gray to Ready for Dyeing (RFD) fabric

# SEAMLESS, LOW COST, JUTE CARRY BAGS USING LOOM

**Developed by: Northern India Textile Research Association (NITRA)**

**Sponsored by: National Jute Board (NJB)**

## Need for Innovation:

- To develop low cost, jute carry bags using a loom by elimination of stitching.

## Details:

- Only the loom used to produce seamless jute carry bags.
- The process of stitching has been eliminated.
- Patent has been filed with application number being 2615/Del/2011.

## Benefits:

- Cost effective carry bags of jute have been developed.
- The process of stitching has been eliminated completely.

## Way Forward:

- Can be utilized in other processes to eliminate or reduce wastage.



Jute Bags

# ENZYMATIC TECHNIQUE FOR WEIGHT REDUCTION OF POLYESTER FABRIC

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To develop a process for bio-technological weight reduction of polyester fabric.

## Details:

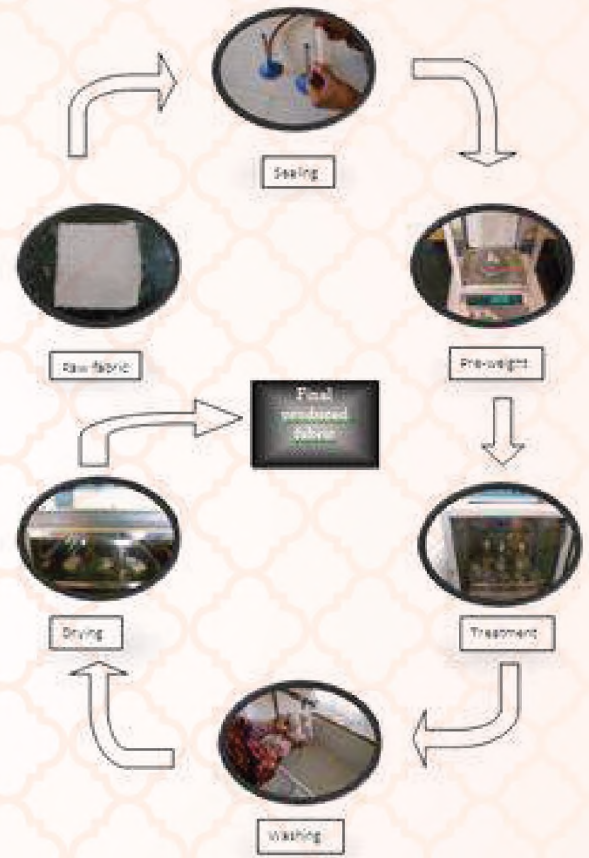
- Crude and purified mixture of enzymes used for weight reduction.
- Using lipase enzyme for hydrolysis of polyester under controlled laboratory condition.
- Involves harsh treatment with strong alkali.

## Benefits:

- Eco-friendly process which does not consume chemicals.
- It is an efficient technology and is energy saving.
- It provides silk like feel to polyester.

## Way Forward:

- Trials have taken place at industrial level.
- Process needs further improvement.



Enzymatic Weight Reduction Process

# MANUFACTURE OF RAMIE BASED PRODUCT USING ECO-DEGUMMING TECHNOLOGY

Developed by: Indian Jute Industries Research Association (IJIRA)

Sponsored by: National Jute Board (NJB)

## Need for Innovation:

- To explore the newer application areas of jute diversified products.
- To propagate ramie cultivation and processing.

## Details:

- Developed eco-degumming (enzymatic) process for ramie fibre.
- Modified processing line combining machinery of jute spinning and semi-worsted spinning line for preparation of finer Jute-Ramie blended yarn.
- Developed fabrics for different end-use specific applications with jute/ramie blends.

## Benefits:

- Ramie farmers will be directly benefitted.
- Value added jute / ramie blended products with finer yarn can be manufactured.

## Way Forward:

- Trials conducted at Wellington Jute Mill, West Bengal.



Raw Ramie Fibre



Degummed and Bleached Fibre



Decorative Carpets with Ramie



Jute-Ramie Based Yarns and Fabrics



Ramie Blended Yarn



# ULTRASOUND ASSISTED SCOURING AND SMOOTH FINISHING OF WOOL AND OTHER SPECIALTY ANIMAL FIBERS

Developed by: Wool Research Association (WRA)

## Need for Innovation:

- To develop an eco-friendly method for scouring of wool.

## Details:

- Conventionally, aqueous scouring method used which requires high amount of chemicals, higher temperature, considerable time and alkaline conditions. This creates effluent treatment problems and affects properties of wool fibre.
- Ultrasonic waves create compression and rarefaction regions. The rarefaction waves create millions of microscopic cavity bubbles. These bubbles implode and generate powerful shock waves which remove the contaminants adhered to substrate.
- Patent is in progress.

## Benefits:

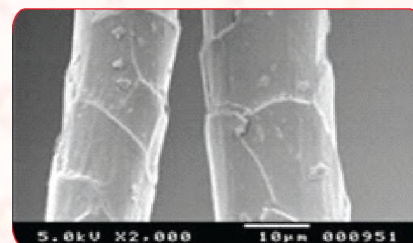
- Results in 20% - 33% saving in time, temperature and chemical dosage.
- Improvement is achieved in handle, whiteness index and there is a reduction in felting tendency of wool.

## Way Forward:

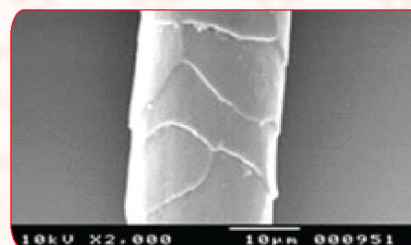
- Industrial trials conducted at composite and decentralized mills.



Ultrasound Assisted Scouring System



Wool Fibres after Conventional Scouring



Wool Fibre after Ultrasound Assisted Scouring

# EXTRACTION OF COLOURANTS FROM MICRO-ORGANISMS

Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

## Need for Innovation:

- To extract different coloured pigments from micro-organisms for application on textile.

## Details:

- Unique method for obtaining colour from micro-organisms which behave like natural dyes giving good dyeing properties.
- Bacterium isolated to obtain pure culture.
- It is grown to obtain colourants in liquid media called broth medium.
- Colour is extracted using chemicals like methanol, etc.

## Benefits:

- It is a chemical free process of dyeing with no harm to environment and the user.
- Provide additional anti-microbial finish on the substrate.
- Can be produced very cheaply.

## Way Forward:

- Can find good application in textile dyeing.
- Fastness of the colour will help in determining the commercial success of the idea.



Violeium in L.B agar



Crude Microbial Dye



Microbially Dyed Nylon



Single bacterium under the microscope



Isolated to obtain pure culture



Regrow to obtain colourants in liquid media called broth medium  
Process of Obtaining Colours

# EFFICIENT ENERGY MANAGEMENT PROCESS TO REDUCE FUEL CONSUMPTION IN THE MULTI-END SILK REELING UNIT

Developed by: Central Silk Technological Research Institute (CSTRI)

## Need for Innovation:

- To develop an efficient process to reduce fuel consumption in multi-end silk reeling unit.

## Details:

- In the conventional energy management, around 220-250 kg of firewood is required to generate steam from the boiler for silk cocoon reeling process for production of 10 kg raw silk (20/22 denier) in 10-basin multi-end silk reeling unit.
- Huge amount of firewood required to produce heat energy for silk cocoon processing.
- New efficient energy management process has been developed with solar flat plate collector water heating system and Ushma Shoshak unit for multi-end silk reeling unit.

## Benefits:

- 46% savings in firewood consumption has been achieved compared to conventional process.
- It is an eco-friendly process as it does not require a non-renewable resource and also it does not produce any harmful pollutants.
- It is a cost effective process.

## Way Forward:

- The developed machine is being utilized for silk reeling unit.
- Similar energy efficient units can be installed by many organizations to have sustainable processes.



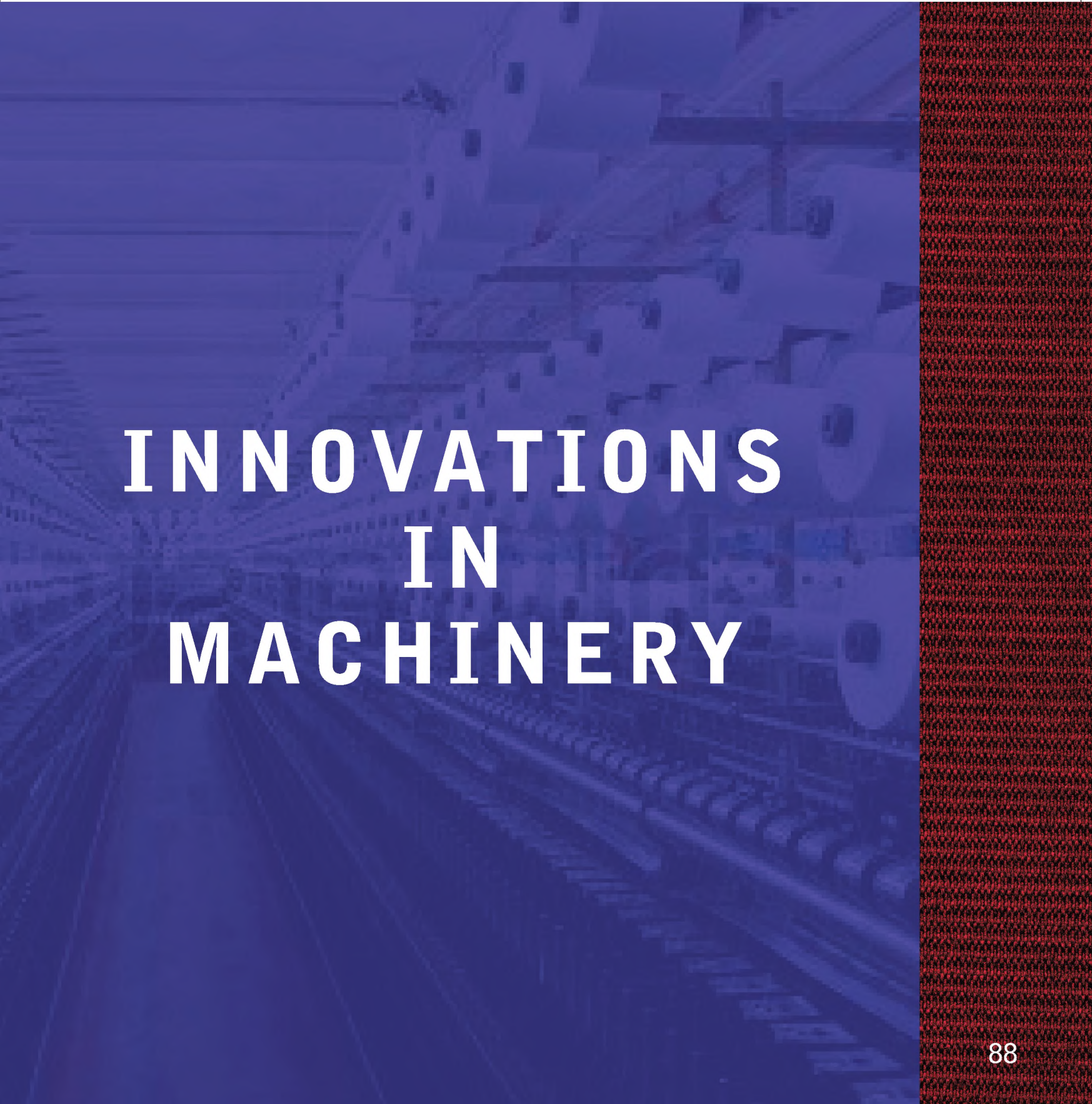
Solar Water Heating System Installed in Multi-end Silk Reeling Unit



Ushma Shoshak Unit Mounted on Boiler



Ushma Shoshak on Boiler Chimney and Insulated Tank



# INNOVATIONS IN MACHINERY

# WASTE MINIMIZATION ON RAPIER LOOM

**Developed by: Northern India Textile Research Association (NITRA)**

## **Need for Innovation:**

- To reduce selvedge waste while using a rapier loom.

## **Details:**

- An attachment has been developed for shuttle less rapier loom which can reduce the selvedge waste.
- The modified loom gives out fringes on one side only instead of two sides as on a conventional loom.
- Patent has been filed with application number being 1856/Del/2011.

## **Benefits:**

- Fringe is present on one side only which reduces the wastage of cotton.

## **Way Forward:**

- Can be used in modern shuttle less rapier loom for minimizing the wastage of cotton.



Original



Modified

# POWER DRIVEN WINDING MACHINE

**Developed by: Development Commissioner (Handlooms)**

## **Need for Innovation:**

- To replace conventional machines which have slow speed and require more effort to operate.

## **Details:**

- The traditional machines have been replaced by high speed machines.
- These have been developed in-house.

## **Benefits:**

- The new machine increases productivity.
- Apart from this, it requires lesser effort to run.

## **Way Forward:**

- These have been adopted by many handloom workers.

Power Driven Winding Machine



# COMPRESSION BANDAGE PRESSURE MEASUREMENT TESTER

Developed by: The South India Textile Research Association (SITRA)

## Need for Innovation:

- To evaluate the compression pressure of bandage/stocking in India.

## Details:

- Instrument developed to measure the compression pressure of bandages.
- Can be used to check on lively patient without the need of any tranquilizer.
- It is helpful to medical professionals in getting effective training and for applying constant tension on the bandages.



## Benefits:

- Paved the way for measuring the compression of bandages/stocking in India.
- It has helped to draft compression standard for the products.
- Can be used to test the products against specific compression requirements.

## Way Forward:

- It is more useful for treatment of varicose vein.



# MULTIPLE BUTA WEAVING SLEY

Developed by: Development Commissioner (Handlooms)

## Need for Innovation:

- To replace the old and time consuming buta weaving technique.

## Details:

- New machine developed to increase the speed of weaving.
- All the designs are woven simultaneously which increases the speed significantly instead of one after the other.

## Benefits:

- Machine will reduce the effort required as well as the time consumed for weaving.

## Way Forward:

- It is being distributed to several handloom workers for their usage.



Buta Weaving Old Technique



Multiple Buta Weaving Sley

# DETERMINING HEAT AND LIGHT CUTTING ABILITY OF CURTAINS

Developed by: Northern India Textile Research Association (NITRA)

## Need for Innovation:

- To assess the performance of blackout fabrics by accurately measuring its heat and light cutting ability.

## Details:

- First-of-its-kind instrument developed to measure the heat and light cutting ability of all types of fabrics.
- It has different sources of light with varying intensities to simulate both natural and artificial lights.
- Patent has been filed with application number being 180/Del/2012.

## Benefits:

- Machine to assess the performance of blackout fabrics.
- Colour fastness to light can also be measured.

## Way Forward:

- Used to measure the performance of curtains in blocking light.
- Can be used to measure performance of fabrics used in movie projector screens, planetariums, etc.



# ENHANCED OIL RECOVERY FROM COTTON SEEDS BY PULSED ELECTRIC FIELD (PEF) TECHNOLOGY

Developed by: Ahmedabad Textile Industry's Research Association (ATIRA)

## Need for Innovation:

- To enhance the recovery of oil from cotton seeds.

## Details:

- Oil recovery done using technology developed in Germany.
- Oil Recovery is enhanced from 12% to 14% level.
- Indian Patent has been filed with application number being 53/MUM/2013.

## Benefits:

- Recovery of oil enhanced resulting in greater efficiency.
- Significant impact on reduction in the prices of cotton due to increased availability of cotton seed oil.

## Way Forward:

- Enhanced recovery of cotton seed oil in Gujarat due to this technology: 61,200 MT.
- Increase in revenue: Rs. 270 Crores.
- Possible reduction in cotton prices by Rs. 2,000/Bale.



# SYNTHETIC BLOOD PENETRATION RESISTANCE TESTER

**Developed by: The South India Textile Research Association (SITRA)**

## **Need for Innovation:**

- To assess and standardize resistance of materials used in protective clothing to penetration by blood and blood borne pathogens.

## **Details:**

- An instrument has been developed to assess the protection of the fabric used in making protective clothing against infectious pathogens.
- The test for protective clothing done according to the standards ASTM 1670 and ASTM 1671.

## **Benefits:**

- The tested surgical fabric protects blood and blood borne infections from entering into the body.
- The development of instrument to reduce the time as well as the cost involved in testing samples.

## **Way Forward:**

- Can be used to test protective clothing according to the international standards.





# ERGONOMIC WORKSTATION FOR HAND EMBROIDERY AND PREGNANT WORKERS

Developed by: National Institute of Fashion Technology (NIFT)

## Need for Innovation:

- To provide workers a comfortable posture while working.

## Details:

- The ergonomic ring frame workstation for hand embroidery workers has the following features:
  - An adjustable ring frame tilt
  - Axially rotating ring
  - Height adjustable elbow cushion and ring frame
  - Material and thread keeping tray
  - Stable tripod stand
- For pregnant workers in readymade garment industry, a sitting table is provided with 10 degree inclination and an oval cut in front for the abdomen.
- A chair prototype has been prepared with 10 degree front inclination, shin rests and minimal rocking base.

## Benefits:

- It helps improve the posture of workers while they work.
- It provides them with comfort.

## Way Forward:

- Can be distributed in all the clusters of the country where such requirement is there.



Ergonomic Ring Frame



Ergonomic Workstation for Readymade Garment Industry



# HORIZONTAL WARPING MACHINE AND NEW BEAMING PROCESS

**Developed by: Development Commissioner (Handlooms)**

## **Need for Innovation:**

- To replace the vertical warping machine and old beaming process which are difficult to operate and slow.
- Also, to improve the quality of output.

## **Details:**

- The vertical warping machine has been replaced by a horizontal warping machine.
- Also, a new beaming process has been introduced.
- This has been done to provide easier operation.

## **Benefits:**

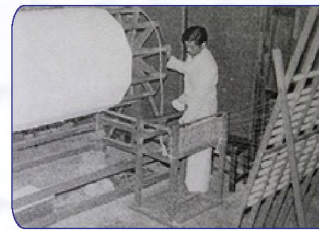
- The new machines have an efficient and fast process.
- They give out product of high quality.

## **Way Forward:**

- These are currently being used by many handloom workers.



Vertical Warping



Horizontal Warping



New Beaming Process



Old Beaming Process

# JACQUARD WEAVING WITH HARNESS

**Developed by: Development Commissioner (Handlooms)**

## **Need for Innovation:**

- To improve the traditional jala weaving technique used for jacquard weaving and remove inconsistencies like faulty shedding.

## **Details:**

- Harnesses have been introduced to eliminate the problems being faced.
- Improved technology results in production of good quality products.

## **Benefits:**

- The shed is very clear which results in getting a good uniform weave.
- The quality of the product is significantly improved.

## **Way Forward:**

- It is being used by several handloom workers.
- It can be supplied to many more workers.



Jala Weaving with Jacquard



Jacquard Weaving with Harness

# CABINET DYEING OF YARN

**Developed by: Development Commissioner (Handlooms)**

## **Need for Innovation:**

- To improve the process of yarn dyeing for achieving better quality.

## **Details:**

- Cabinet dyeing machine has replaced the crude method of open vat dyeing for dyeing yarns.
- The new process will give improved quality of dyed yarns.

## **Benefits:**

- Cabinet dyeing is a faster dyeing process.
- The dyed yarn does not get damaged as is the case with vat dyeing.

## **Way Forward:**

- It is currently being used in handloom clusters of the country.



Open Vat Dyeing



Cabinet Dyeing

# VARIOUS TECHNOLOGY INTERVENTIONS FOR IMPROVED EFFICIENCY

Developed by: Development Commissioner (Handlooms)



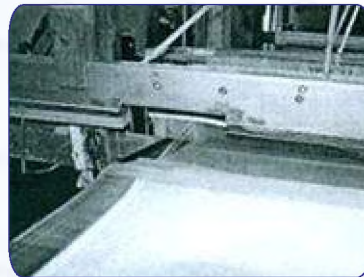
Loom with take-up motion for automatic winding of woven cloth



Loom with fly wheel for easy beating and uniform picks in cloth



Bi-Fab Handloom for weaving two fabrics simultaneously



Korvoi Sley (Left Side) which eliminates extra persons for weaving contrast border



Korvoi Sley (Right Side)



Computerised designing with many options for colours and weaves



Computerised card punching for getting flawless design cards

# SELF-LUBRICATING NYLON (SLN) LOOM PARTS

Developed by: Man-Made Textiles Research Association (MANTRA)

## Need for Innovation:

- To eliminate the problem of oil staining on woven fabrics.

## Details:

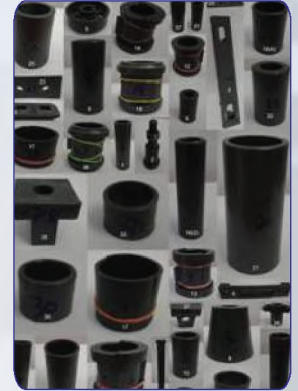
- The staining of oil on woven fabrics by conventional looms and its removal caused problems to the operator.
- To eliminate this, self-lubricating nylon loom parts have been developed for conventional looms.

## Benefits:

- No staining of woven fabric by oil as oil is not required.
- Cost of production is reduced due to higher production & efficiency.
- Savings of power consumption to the extent of 6%.
- Less wear and tear of loom parts.
- Stainless fabric is produced, thereby improving weaving quality.

## Way Forward:

- Promoted well in the local market as well as in the weaving clusters of Maharashtra.
- SLN loom parts in demand for conventional looms in Surat.
- The demand is picking up supported by intensive marketing efforts.
- SLN parts have been installed on approximately 2,200 power looms.



Loom Parts

# NEW AND IMPROVED CROSS BAR HORIZONTAL LOOM

**Developed by: Indian Institute of Carpet Technology (IICT)**  
**Sponsored by: Development Commissioner (Handicrafts)**

## **Need for Innovation:**

- To improve the efficiency and speed of traditional looms.
- To decrease the effort required in their operation.

## **Details:**

- Traditional hand knotted carpet loom has been used by traditional carpet weavers but the design of the loom has remained same for many years. No research done to enhance productivity and reduce drudgery of artisans.
- The new, improved loom has been designed by Indian Institute of Carpet Technology (IICT), Bhadohi.
- The loom has improved warp path and design.

## **Benefits:**

- Fast and efficient operations.
- Easier to operate for carpet weaver with simple technology suited to Indian village conditions.
- Provides safer weaving conditions with the flexibility to produce hand knotted and Tibetan/Nepal, Shaggy and Sumak on the same loom.
- Provides uniform and firm knotting density.
- Better ergonomics and visibility to the weaver so that workers can work continuously for longer hours.
- Longer length of carpet can be produced.

## **Way Forward:**

- Trials have been conducted for
  - Hand Knotted
  - Tibetan
  - Shaggy
  - Sumak

# TECHNOLOGY FOR SILKWORM REARING AND MULBERRY CULTIVATION

Developed by: Central Sericultural Research and Training Institute

## Cocoon Harvesting Machine:

- Harvesting cocoons from the plastic collapsible mountages requires substantial manpower and time.
- A machine for harvesting cocoons has been developed to save on time and cost of manpower.
- Takes about 4-5 seconds to harvest cocoons from one plastic moutage, without damaging either the moutage or the cocoons.
- The cocoons are also deflossed in the process.
- The machine has been offered to National Research Development Corporation for commercialization.



## Dusting Machine:

- Dusting of disinfectants and lime powder is an activity that is repeated during silkworm rearing.
- Uniform dusting of the powder formulations in young age silkworm rearing (chawki) ensures better cocoon crops.
- A machine has been developed to achieve effective dusting without causing serious hazards to the chawki rearer.
- It can reduce drudgery, health hazards to practitioners and save on cost of work force in commercial chawki rearing units.



## High Capacity Mulberry Leaf Chopper:

- Mechanization of chawki rearing essential for techno-economic feasibility of commercial chawki rearing units.
- Leaf chopping for feeding the young silkworm larvae is a specialized activity that requires skilled manpower.
- To standardize the operation and to save on time, drudgery and cost of manpower, a high capacity leaf chopper has been developed.
- The capacity of chopping is 500 kg leaf per hour.



### Mechanized Silkworm Rearing Beds:

- Large scale cocoon production demands mechanization of operations, especially, due to non-availability or high costs of manpower.
- Mechanized rearing beds for late-age silkworm rearing have been designed to address these issues and encourage large investments in cocoon production.
- The system consists of PVC rearing stands of uniform width.
- A dusting unit has been mounted on the rearing PVC rack, which operates very conveniently on these racks.



## PROTOTYPE VESSEL FOR SUPERCRITICAL CARBON DIOXIDE (SC-CO<sub>2</sub>) DYEING

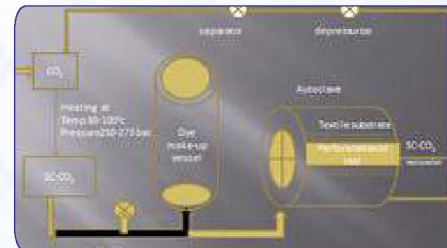
Developed by: Synthetic and Art Silk Mills Research Association (SASMIRA)

### Need for Innovation:

- To develop a novel technique of dyeing and dyeing vessel.

### Details:

- The SC-CO<sub>2</sub> technique is widely used for the extraction of flavours and perfumes.
- The principal feature of SC-CO<sub>2</sub> behaving as a solvent used to replace water in textile processing.
- Developed a lab scale process for supercritical carbon dioxide dyeing of polyester and cotton.



Line diagram of Prototype Vessel

### Benefits:

- Conservation of water due to its elimination in textile processing.
- Zero effluent generation.
- Marginal cost of operation.

### Way Forward:

- The successful development will change the scenario of wet processing.



# ECO-DEGUMMING MACHINE FOR DEGUMMING OF SILK IN HANK FORM

**Developed by: Central Silk Technological Research Institute (CSTRI)**

## **Need for Innovation:**

- To develop an efficient and eco-friendly eco-degumming machine for degumming of silk in hank form.

## **Details:**

- An eco-degumming machine specially designed for degumming of silk in the hank form.
- It is intended to benefit the yarn processors in a big way as more than 90% of the silk yarn is processed in the hank form.
- Chemicals not required for degumming and it does not produce any discharge.

## **Benefits:**

- No chemicals are used for degumming and therefore, the process is both economical and environment friendly.
- The process can be carried out with zero discharge, if sericin is recovered by spray drying/evaporation in pure form (98% pure) from the waste water.
- Production of superior quality of degummed silk yarn with enhanced luster.
- No fibrillation (white dusty appearance) or chemical damage of the yarn due to degumming.
- Enhanced productivity to the tune of 2 -3 times as compared to the conventional process.
- Saving in water requirement of about 6-10 times compared to the conventional process.
- Saving of energy.
- Recovery of sericin which can be used for varied applications in cosmetic, food, pharmaceutical and textile industries.

## **Way Forward:**

- The developed machine can be utilized by many yarn processors.





# INNOVATIONS IN MARKETING

# DEVELOPMENT OF WEBSITE AND VIDEOGRAPHY OF THE EVENTS

**Developed by: Development Commissioner (Handicrafts)**

## **Development of website [www.craftclustersofindia.in](http://www.craftclustersofindia.in)**

- The main objective of the initiative is:
  - To showcase different products made by cluster artisans across India.
  - To provide a market linkage to artisans/clusters so that buyers can approach them directly.
- Artisans are provided with technical / marketing know-how for making these products.
- Showcases 35,312 products under 32 different categories.
- The buyer can reach the product through Craft / Sub-Craft, Product / Sub - Product & Region.

## **Development of website [www.themcrafts.in](http://www.themcrafts.in):**

- The main objective of the initiative is to link tourism with promotion of handicrafts.
- Portal has two sections:
  - heme crafts (NeedleWork, Tribal Crafts, Natural Fibre and Ecofriendly Crafts, Fashion Accessories, Festive Decorations)
  - Information on Tourist places (Srinagar, New Delhi, Agra, Jaipur, Udaipur, Ahmedabad, Indore, Varanasi, Darjeeling, Patna, Bhubaneswar, Guwahati, Goa, Mysore, Kochi, Chennai and Pondicherry)

## **Videography of the Events:**

- All the events conducted by the D/C Handicrafts are recorded. Apart from this, all the projects conducted by the organization are video graphed. These videos are displayed on the website and kept for self-reference.

**Developed by: Export Promotion Council for Handicrafts (EPCH)**

## **Live web casting of EPCH activities:**

- Live programmes are transmitted to the audiences who are unable to attend the activities such as workshops, seminar, training programmes, shows, etc.
- Helps the manufacturers and exporters from remotest part of the country and overseas buyers situated thousands of miles away to view the event while sitting in the comfort of their homes and offices.

# WEB ENABLED MARKETING AND ENGAGEMENT OF HIGH END DESIGNERS

**Developed by: Development Commissioner (Handlooms)**

1. Development of a web portal for the online marketing of handloom products.
2. Development of a web enabled application for online monitoring of weavers' credit card.
3. Introduction of yarn pass book for yarn supply under 10% price subsidy to the handloom weavers. The pass book will ensure the yarn is supplied to weavers at competitive prices and that there is no misuse/overcharging. These have been distributed to more than 2 lac weavers.
4. Engagement of many professional, high end designers for the following:
  - a. Creating market linkages by using connects of the designers in the industry.
  - b. Promoting the brand at various forums to establish an association with it.
  - c. Providing training to local and upcoming designers to help in development of their skills.
5. Uploading of traditional designs with their technical specifications which can be utilized by many weavers and others. The detailed information is available in the regional language and with free of cost download facility. The url for the website is <http://www.designdiary.nic.in/>

# BUYER SELLER MEET (BSM) FOR PROMOTION OF HANDLOOMS

**Organised by: Development Commissioner (Handlooms), National Textile Corporation (NTC)**

## **Objective:**

- To promote sales of handloom products through domestic network of retailers and brands

## **Details:**

- A handloom week was organised in April, 2014 inviting 35 clusters from across India to showcase their products along with brands, retailers and designers to facilitate round table discussions between them addressing their queries regarding product, quality, delivery, sampling etc.
- The purpose of this meet was to push brands to adopt clusters for sourcing either the fabrics or the finished products from the respective clusters.
- Once initial interactions and meetings have been done, as a next step, a Project Management Consultant (PMC) will be appointed to carry forward this initiative. The scope of work for the PMC will involve:
  - Two jackets have been created:
    - Planning the whole sequence of events leading to sale of Handloom products through brands and retailers
    - Coordination of each step with brands, retailers, NTC and ministry
    - Planning of each meeting and events
    - Coordination for entire sourcing mechanism
    - Monitor quality and setting quality testing mechanisms with the help of a reputed quality testing lab
    - Design marketing plan and coordination of implementation
    - Preparation of TOR and coordination for all outsourcing required
- The products will then be marketed by retailers/brands at their stores. A gala launch event will be planned to create the initial buzz in the market.
- A lot of campaigning, awareness programmes, in-store promotions would be done to create awareness and push the sales of these garments during that 4-5 week period.



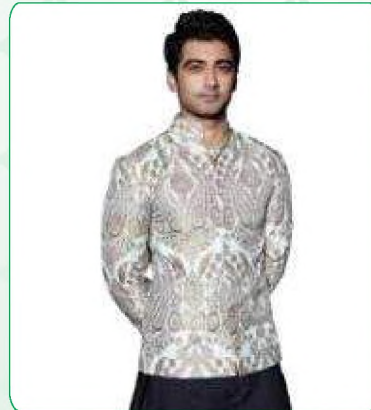
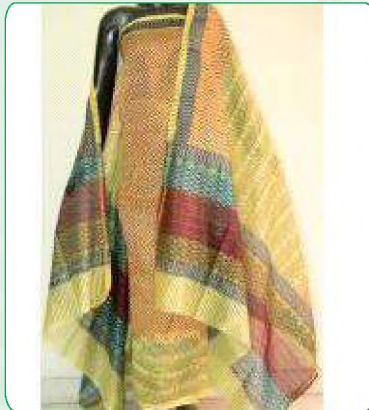
### Benefits:

- Promote handloom products (apparel) for mass consumption
- Bring handloom products under the ambit of organized retail
- Brands/Retailers will work directly with cluster people and will help in linking the weavers to the market.
- This platform will also bring in greater exposure to the weavers in terms of new designs, techniques etc.
- Facilitate sourcing of handloom products with ease
- Increase wages paid to the weavers and craftsmen
- Promote handlooms as craft of India which is cool, trendy and appeals to the youth



### Extent of Adoption:

- The buyer-seller meet conducted received a good response from the brands/retailers.
- After the discussions, many of the big brands/retailers have shown interest to work with these clusters. They are interested in sourcing either the finished product with variations in colours and designs or/and the fabric which they can convert into different garments like shirts, etc.
- Even the clusters are willing to change the product specifications like colours, designs, patterns etc. as per the need of the buyers.



# INDIA INTERNATIONAL GARMENT FAIR FOR SHOWCASING LATEST TRENDS AND FASHIONS IN THE APPAREL INDUSTRY

**Organised by: Apparel Export Promotion Council (AEPC)**

## **Objective:**

- To showcase characteristic trends and fashions along with the innovations tried out by many national and international production houses in the apparel industry.
- To serve as a platform and an opportunity for large number of exhibitors and buyers from across the globe to interact under one roof.

## **Details:**

- AEPC in association with four major garment exporters associations have been organising the India International Garment Fair (IIGF) since 1988.
- These fairs are organised twice a year, in the months of January and July to showcase autumn/ winter collections and spring/summer collections respectively.
- More than 50 fairs have been organised till now.
- In each fair the brands/retailers showcase their entire collection at the booths allocated to them.
- Apart from showcasing the products at the booths, a theme pavilion is also set-up to display the latest trends and fashions across the apparel industry.
- A fashion show is also organised during the event by some of the major designers.



**Benefits:**

- Promotion of brands/retailers
- Platform for brands to showcase their new collections and innovative products
- IIGF acts as a medium for the buyers to learn about the new trends and fashions in the apparel industry

**Extent of Adoption:**

- The response of these fairs has been very encouraging and commendable and every year more and more brands/retailers are getting associated with IIGF.
- Also, due to this continuous association with IIGF since the past 25 years, these brands/retailers/buyers look forward to attending these garment fairs.







