

R & D Projects Done during Last 10 Years **(1999-2000 To 2008-2009)**

Government sponsored projects

Completed :

- 1. Title : Development of industrial yarn for specific end-uses (Sponsored by Ministry of Textiles, Govt. of India)**

Abstract :

- To develop industrial yarn for different end-uses
- To produce industrial fabric from the above
- Carrying out comparative studies to assess and amplify its relative advantages over the others

Highlights :

In this study, efforts were made for developing DREF spun yarn and to explore the possibilities for use of such yarn in diversified applications. The fabrics developed for such applications which were identified for the study have shown encouraging performance. In most of the cases, where comparisons were done, the experiment samples have shown superiority over the market samples. In general, the results show that due to structural composition of the yarn wherein the advantage of specific properties of individual fibre component are utilized to a greater extent, the tensile and abrasion properties of the fabrics are better than that of conventional fabrics. It can be further concluded that the DREF yarns are very innovative with adequate potential for developing speciality fabrics and can emerge as a future yarn for use in technical textiles.

Area of applicability :

- Tarpaulin & truck covers
- Canvas
- Type cord
- Cut resistant fabric for seat covers in public transport
- Protective clothing (as heat resistant fabric) for the operators working in high temp. environment

Target beneficiaries :

Technical textile manufacturers & users

Contact Person : Director, NITRA

Location : Ghaziabad

2. Title : Development of indigenous instrument for scanning & separation of contaminants from Indian cotton (Sponsored by DST, Ministry of Science & Technology, Govt. of India)

Abstract :

- Identification & classification of the contaminants to be separate out
- Developing suitable technology for scanning and separation of the contaminants under Indian condition
- Evaluation of the technology so developed to evaluate the suitability and strength of the indigenously developed technology in the instrument

Highlights :

A pilot model of the above instrument has been developed. It is based on to snap the image of the cotton without contaminants which will act as a reference image and then to grab the images of contaminated cotton continuously and record its difference from the reference image which would reveal the presence of contaminants. The snap operation and grab operation are implemented using programming language visual basic. The decision regarding the presence or absence of the contaminants is obtained by using basic image processing operations and have the detection fast.

Area of applicability :

- (1) Scanning & separation of contaminants
- (2) Ginning technology

Target beneficiaries :

- (1) Ginners
- (2) Ginning machine manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

3. Title : Development of cost effective dyeing system for jute yarn in handloom (Sponsored by Ministry of Textiles, Govt. of India – SJDF Scheme)

Abstract :

Normally, it has been found that in jute dyeing acid dyes and direct dyes are used extensively due to cheap and brightness but their fastness properties are very poor and many dyes are not eco-friendly, hence not suitable for export market. Reactive dyes are not very popular due to many factors like these dyes require heat energy for washing and water requirement in dyeing is very high. In handloom sector, water heating is a problem. In this work, the machines has in-built heating device which can help dyer to get uniform heating, hot water without any need of boiler and any type of fuel like bio-mass which is available abundantly in rural areas, can be used effectively. Besides, hot water will also be

useful for soaping/scouring which helps to mention economy of the process. It means dyeing cost will be low.

Highlights :

This improved system will be suitable to give better colour fastness properties, better uniformity of heating, better absorbency and chemical cost of processing will be lower due to lower consumption. The quality consistency can be maintained.

Area of applicability :

Dyeing technology of jute yarn

Target beneficiaries :

Handloom sector

Contact Person : Director, NITRA

Location : Ghaziabad

4. Title : Identification, extraction and purification of natural dyes from indigenous plant species for textile application (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

The work in this project has been carried out by identifying three plant species namely, Tesu flower, Pomegranate rind and Dolu bark, for the extraction of natural dyes by using a suitable solvent media. Acidic, basic and neutral media have been used for extraction of the dyes in order to optimize the extraction conditions. Impurities from the natural dyes have been removed by drying and water immersion technique prior to solvent extraction. Optimization of extraction conditions has been done by studying the effect of pH, mass of liquor ratio, temperature and soaking/extraction time to maximize yield of the dyes.

Identification and purity assessment of the final dyestuff has been done by micro-chemical analysis, UV-Visible Spectroscopic and HPTLC techniques. The application of natural dyes on different substrates (cotton, wool and silk) under different conditions have been studied by using various mordents like ferrous sulfate, alum and stannous chloride. Potassium dichromate and copper sulfate, though having good mordanting properties, have been judiciously eliminated considering their toxicity and ecological aspects. Fastness properties of the dyed substrate have been studied against washing and light. Physical chemistry of dyeing mechanism i.e. the nature of dye-fibre interaction has been evaluated by carrying out thermodynamic and kinetic studies. Eco-friendliness of extracted dyes has been studied by analyzing the extracted dyes for the presence of toxic aryl amines, pesticides and heavy metals.

Highlights :

A pilot plant model has also been developed for effective extraction of the dyestuff at the most techno-economic level using a counter current step extraction procedure. It shows pretreatment, extraction, membrane separation, evaporation and drying, the essential unit operations involved for enhancing purity of dyestuff and its yield.

Area of applicability :

- (1) Dyeing of fabric
- (2) R&D work in application of natural dyes

Target beneficiaries :

Wet processing industry

Contact Person : Director, NITRA

Location : Ghaziabad

**5. Title : Development of MIS in textile wet processing for better decision making
{Sponsored by Ministry of Information Technology (DST), Govt. of India}**

Abstract :

As per the need of the wet processing textile industry this software was developed and installed in one textile mill. This system gives immediate costing of each and every lot quality-wise and shade-wise. Production daily/monthly can be viewed or printed as per the need of the management. The system can control inventory and value loss which gives better idea to management to decide upon the marketing and product wise strategies.

Highlights :

Already implemented in one textile mill and they find it is useful. A demonstration was organized and several mills expressed their desire to have the system. The whole system is developed in window base and oracle software.

Area of applicability :

Computerization of management information system

Target beneficiaries :

Textile wet processing units

Contact Person : Director, NITRA

Location : Ghaziabad

6. Title : Development of micro-encapsulated enzymes for bio-polishing of knitted fabrics (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Need was felt to develop micro-encapsulated enzymes for bio-polishing of knitted fabrics.

Highlights :

- Micro-encapsulated enzymes were prepared by phase separation method and parameters to prepare micro-encapsulated enzyme were standardized
- Bio-polishing of knitted fabrics using both micro-encapsulated and enzyme as such, was possible. Bio-polishing effect was observed by properties like weight loss, strength loss, gain in air permeability, bending length and whiteness index
- The conditions for bio-polishing of knitted fabrics using micro encapsulated enzyme were standardized

Area of applicability :

For giving special effects to knitted fabrics

Target beneficiaries :

Textile wet processing units

Contact Person : Director, NITRA

Location : Ghaziabad

7. Title : To develop a suitable device to control the power quality parameters to achieve better yarn and fabric quality (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- To study the effect of power quality on spinning performance
- To study the effect of voltage and frequency variation on the yarn quality
- To study the losses due to variable power quality parameters
- Study the effect of power quality on warp and weft breakages on different type of looms
- Study the productivity gain or losses due to variable power parameters.
- Study the variable frequency and voltage on loom cycle and to determine how these parameters effecting the fabric productivity and quality.
- To decode the variation in RPH due to play in the loom and give the signal to the devices to ensure constant RPM.

Highlights :

In this project NITRA has developed a power quality controller which can be installed in a ring-frame and measure the power quality parameters & control the same. This instrument can be a useful tool for the textile mills to make an in-depth study and analysis of the effect of power quality on quality of spinning yarn.

Area of applicability :

Study of power quality parameters

Target beneficiaries :

- (1) Textile spinning units
- (2) Power quality parameters equipment manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

8. Title : I.T. survey in power loom sector (Sponsored by Ministry of Textiles, Govt. of India)**Abstract :**

There was a need to find out the possibilities of inducing IT in powerloom sector.

Highlights :

NITRA surveyed Northern India in the following clusters :-

Tanda, Jalalpur, Kanpur, Meerut, Panipat, Bhilwara, Jaipur and Ludhiana have submitted our report to Ministry of Textiles. This was the first phase of our survey. Our aim was to help powerloom sector, export their product to various countries.

Analysing the first phase we could conclude that there is not much scope in this sector. However, in some of the areas like Panipat, Ludhiana and Bhilwara response from entrepreneurs was quite positive.

Area of applicability :

Powerlooms

Target beneficiaries :

Power loom sector

Contact Person : Director, NITRA

Location : Ghaziabad

9. Title : An approach towards separation of contaminants from Indian kapas through indigenously developed instrument (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Need was felt to indigenously develop an instrument which can help ginners in separating the contaminants.

Highlights :

The results show that out of the two types of contaminants the developed instrument achieved the elimination of heavier contaminants to the extent of 83.4%. However, some of the above particles which are mainly vegetable in nature and are tightly adhered to the cotton balls, are not separated out from the main stream of material. The results also show that the elimination of the lighter contaminants in this instrument is achieved upto 61.2% which seems to be not that efficient as compared to the elimination of heavier contaminants. The attempts which are made in this work developed an indigenous device become successful in achieving the elimination of contaminants to a satisfactory level which is about 80%. It is also observed that effectiveness of elimination of heavier contaminants is more than compared to the contaminants which is due to certain limiting conditions of developed mechanism.

Area of applicability :

Separation of cotton contaminants

Target beneficiaries :

- (1) Ginners
- (2) Ginning m/c manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

10. Title : Design and development of indigenous low cost rotor for rotor spinning (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

The design of the rotor is critical for the performance of a rotor machine and for yarn quality. The rotor being the costliest part adding maximum to the cost of machine. The technology being imported is very costly. Thus puts a limit on profitability and viability of the projects in many cases. In India rotors of International standard are not manufactured yet and not much work has been done on it.

The present study was therefore designed keeping the above view in consideration i.e.

- To design and develop low cost rotor for rotor machine
- Evaluation of rotors so developed w.r. to improve rotors

Highlights :

The two fabricated rotors, rotor A (Groove depth 1.5mm) and rotor B (groove depth 3.0mm) with reduced groove angle provides better results in terms of quality and shall be cost effective in comparison to imported rotors available in the market. In this study metallurgical aspects of the rotor are studied for material specification, hardness, tolerance, and accuracy. From the study it can be concluded that :

- Yarn strength improves in both cotton & polyester yarns when the angle of rotor groove is reduced, indicating that compactness is more in lower groove angle rotors.
- When the depth is increased from 1.5mm to 3.0mm the yarn strength is improved in case of polyester yarns, but there is no significant impact on cotton yarns.
- Increase in depth significantly improves the yarn quality both in cotton & polyester. Thus more depth of groove improves the uniformity.
- Imperfections have considerably reduced in both rotors. Thus better yarn can result with improved design.

Area of applicability :

- (1) Rotor spinning
- (2) R&D in rotor development

Target beneficiaries :

- (1) Spinning mills
- (2) Rotor manufacturers
- (3) Open-end m/c manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

11. Title : Development of a ginning machine with improved technology to ensure high quality ginning (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- To study the existing ginning technology & practices with a view to identify the short comings and limitations
- To develop a suitable ginning machine for high quality ginned lint
- Evaluate the newly developed machine and to compare it with the existing technology

Highlights :

During the process of optimization, it is noticed that the effective elimination of seeds from the ginning zone is not taking place as and when the rate of production is taken up. It is further noticed that crushing of seeds during the above process due to the delay is also deteriorating the quality of ginning. The above observations are the major bottleneck and fresh thought is required to make further headway in this work.

Area of applicability :

- (1) R&D in ginning machine technology
- (2) Improvement in ginning processes

Target beneficiaries :

- (1) Ginners
- (2) Ginning m/c manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

12. Title : Protective clothing from jute {Sponsored by Ministry of Textiles (SDJ)}**Abstract :**

Producing textiles to combat with scorching sun-rays, heat and heavy wind for apparels & furnishing fabrics. There was a need to use jute in highly technical areas.

Highlights :

Jute-based fabrics of varying construction were prepared using 100% cotton in warp and 100% jute and jute/viscose in weft having different reed/pick. They were pretreated and dyed with reactive dyes and direct dyes. The samples were treated with UV absorber chemical and titanium dioxide. Various finishes and chemicals were applied to develop sun protective clothing. After finishing, physical properties of jute/cotton and jute/viscose were optimized. The SPF values were recorded of all samples on UV analyzer. It has been found that due to the presence of lignin, SPF values are higher even after scouring. Study was also conducted to see the effect of depth of shade, cover factor, effect of dye class, humidity & optical brightener. The values of SPF increased upto sufficient level.

Area of applicability :

Technical textiles

Target beneficiaries :

- (1) Protective clothing manufacturers
- (2) Jute industries

Contact Person : Director, NITRA**Location :** Ghaziabad**13. Title : Standardization scientific evaluation & development of protective clothing using eco-friendly chemicals (Sponsored by Ministry of Textiles, Govt. of India)****Abstract :**

- To develop eco-friendly breathable water/oil repellent fabric based protective clothing
- To develop formulation based on non-carcinogenic chemicals
- Optimisation of the developed formulation on various substrates at different conditions, compatibility of finish chemicals etc.
- Physico-chemicals, eco parameters and comfort properties of the substrate as per need of end uses
- Effect of these formulations on dyed ground for tonal or change of depth
- Semi and bulk scale industrial trial
- Technology transfer to the industry

Highlights :

Fabrics, 100% Cotton & Polyester/Cotton blended (67/33) were selected for dress material (uniform) for the persons of pesticide industry & cotton grower farmers. Commercial water repellent chemicals from various sources were procured and applied on the fabrics. All the fabrics were evaluated and accordingly finishing recipe and conditions were optimized. Bulk trials of optimized recipe were conducted in a mill. Chloropyrophos pesticides applied on the finished fabrics and study for residual amount of pesticide in the fabric evaluated on GC-MS. After this finally garments were fabricated in three designs, out of these fabrics which were given to the persons in pesticide industry particularly involve in handling & mixing of pesticides. The results are found satisfactory in terms of comfortness and protection.

Area of applicability :

- (1) Protective clothing technology
- (2) Eco-friendly chemicals

Target beneficiaries :

- (1) Eco-friendly chemical producers
- (2) Protective clothing manufacturers

Contact Person : Director, NITRA**Location :** Ghaziabad

14. Title : To develop antimicrobial fabrics for their use as protective clothing especially in operating rooms for covering of patients (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- Identification and application of various chemicals and auxiliaries having the potential to kill pathogens in the operation theatre and other hospital premises
- Development of technology to impart antimicrobial properties to various types of fabrics such as gowns, covering & apparels

Highlights :

- Antimicrobial and water repellent cotton and polyester cotton blended fabrics have been prepared.
- The treated and cured fabrics alongwith untreated fabrics have been characterized for their anti-bacterial and anti-fungal properties, water/blood repellent properties, tensile strength, bending length, tearing strength, crease recovery, air permeability, DSC and FTIR.
- Antimicrobial testing of treated fabrics against staphylococcus aureus and aspergillus niger reveals that reduction of 99% of both the organisms have been achieved within one hour, while a reduction of only 7-14% micro-organisms has been observed for untreated fabrics.
- Water and blood repellent testing was carried out by spray method and treated fabrics have been found water/blood repellent.
- Wash fastness studies show that even after 10 washings, the antibacterial properties are retained (99%). However, reduction in the count of fungi has been achieved upto 92% after washings. Treated fabrics show water/blood repellent properties after 10 washings.
- Tensile and tearing strength show decrease after treatment. However, wrinkle recovery angle and bending length show an increasing trend.
- Anti-microbial and water/blood repellent cotton and polyester cotton blended fabrics prepared have also wrinkle free properties.
- Based on the standardized conditions achieved in the laboratory, trials were taken in industry to prepare antimicrobial and water/blood repellent fabrics. Gowns for doctors and patients have been prepared from these fabrics and trials in hospital were taken.

Area of applicability :

- (1) R&D in antimicrobial application
- (2) Protective clothing
- (3) Medical sciences

Target beneficiaries :

- (1) Protective clothing manufacturers
- (2) Chemical auxiliaries manufacturers having potential to kill pathogens
- (3) Hospitals

Contact Person : Director, NITRA

Location : Ghaziabad

15. Title: Development of solar yarn drying machine for drying of textile yarn (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- Use of solar energy application for textile drying purpose
- Reduction of cost of yarn drying by use of solar energy
- Reduce the dependence on conventional fuels and minimize air pollution problems
- To develop a user friendly software for solar yarn drying machine design

Highlights :

The project has been completed successfully. The solar yarn dryer of 50 kg. capacity has been installed at Sheena Exports, Panipat. Exhaustive trials for assessing the performance of the machine has also been taken. The rate of drying is 3 to 3.5 hrs., which is almost equal to conventional drying system. Further it has been planned to scale up the machine capacity to 200 kg. Hybrid system for which the beneficiary party has to contribute about 20% of the total cost. For remaining expenditure a project will soon be submitted to MNES. Under the project, a software on "Solar yarn drying machine design" has been successfully completed.

Area of applicability :

- (1) Drying of textile yarn technology
- (2) Solar yarn drying technique

Target beneficiaries :

- (1) Textile wet processing
- (2) Drying machine manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

16. Title : Industrial application of developed adsorbent column technology for removal of color from textile waste water (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- Scale up of the technology to pilot plant level and its industrial trial
- Development of a facility for bulk scale production of adsorbent
- Trials on the pilot plant using actual effluents from cotton process house
- Optimization of process parameters

- Investigation on reuse of water and recovered chemicals and dyes in to the process stream

Highlights :

A suitable adsorbent material possessing some desirable ionic characteristics has been developed in the laboratory. The material shows high adsorption capacity for reactive dyes, which are anionic in nature. The role of adsorbent is to remove the unwanted dyestuff from textile effluent preferentially by passing through a column of the adsorbent.

A laboratory scale model for preparation of the adsorbent material has been designed and installed in the environmental laboratory. The pilot plant is working satisfactorily and the experiments on removal of reactive dyes from dyeing effluents are in progress. The parameter of investigation are flow rate, dye concentration, nature of surfactant, pH etc. The adsorbent column technology is also being implemented in industry for the recovery of surfactants.

Area of applicability :

- (1) Production of adsorbent
- (2) R&D in effluent treatment of textile waste water

Target beneficiaries :

- (1) Textile wet processing
- (2) Adsorbent producers

Contact Person : Director, NITRA

Location : Ghaziabad

17. Title : Recycling of effluent of textile industry for zero effluent discharge (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- Abatement and minimization of environmental pollution
- Conservation of water by recycling

Highlights :

An explorative search has been accomplished on development of a suitable technology for recovery of water from textile wet processing effluent with subsequent mode of water replenishment for recycling the same in the process house without any adverse effect on the product quality. The scheme starts with segregation of streams, a thorough analysis on process inventory for their biodegradability with a relevant "end-of-pipe" treatment scheme for water reclamation from the dilute waste stream.

The scheme has been successfully tested and implemented in a large process house in Ghaziabad where 50% of water is being recycled. The second industrial project with a stiff challenge of 65% water recycling in an International textile unit at Panipat is installed.

Area of applicability :

- (1) Conservation of water
- (2) R&D in zero effluent discharge technology

Target beneficiaries :

- (1) Textile wet processing units
- (2) Effluent treatment solution providers

Contact Person : Director, NITRA

Location : Ghaziabad

18. Title : Review of environment statement for textile industries (Sponsored by CPCB, Delhi, Ministry of Environment & Forest, Govt. of India)

Abstract :

- To assess the status of environmental management in composite textile industries
- To draw an action program for improvement in environmental management

Highlights :

The objective of this statement is to reevaluate the prevailing environmental statement for textile industries. Thorough study has been conducted considering various textile substrates based on analysis of data received from various states. The data has been analyzed in terms of specific water consumption and the corresponding effluent generation.

Studies have also been carried out on the degree of water recycling, expected quantum of sludge generation and the post-handling scenario of sludge management specifically for the primary sludge. The study concludes with the remedial steps to eliminate the present lacuna/shortcomings of data reporting for better environmental management. The report has been submitted to CPCB, Delhi.

Area of applicability :

Environmental management system

Target beneficiaries :

Textile industry

Contact Person : Director, NITRA

Location : Ghaziabad

19. Title : Development of cost effective rotor yarn based knitted fabrics by surface modification (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

There was a need to develop knitted fabric which in cost effective and rotor yarn base.

Highlights :

Under this project a technique is suggested to use rotor yarn in knitting. Various experiments were carried out to select suitable yarn structure out of rotor technique. After selection of suitable structure, it was used in knitting. Knitted fabric was then treated with various chemicals and softener and compared with the conventionally used same count ring yarn. Results were encouraging.

Area of applicability :

Knitted fabric manufacturing

Target beneficiaries :

Knitting industry

Contact Person : Director, NITRA

Location : Ghaziabad

20. Title : To explore application of naturally coloured cotton in textile products (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Need was felt to promote application of naturally coloured cotton in textile products.

Highlights :

Under this project various yarn samples of natural coloured cotton with different composition and fiber properties were prepared and tested for physico-chemical properties. These yarn samples were used as weft during weaving process while grey cotton yarn was taken as warp. Finally, various products like kids wear,

garments, toys, caps, curtains, non-woven fabric etc. were developed and demonstrated in various forum to popularize the application natural coloured cotton.

Area of applicability :

- (1) Cotton textile fabric
- (2) Naturally coloured cotton cultivation

Target beneficiaries :

- (1) Cotton spinning mills
- (2) Naturally coloured cotton growers

Contact Person : Director, NITRA **Location :** Ghaziabad

21. Title : A project on design and development of an instrument for measuring objectively the fabric hand {Sponsored by Ministry of Non-conventional Energy sources (MNES), Govt. of India}

Abstract :

- To develop a suitable & low cost instrument more or less comparable of existing KES (Kawabata Evaluation System) which is an import substitute
- To measure the fabric hand (softness) of apparel fabrics using an extraction force principle
- Hand values objectively measured by this instrument simultaneously reflect the physical and surface properties of the fabric that are important in determining overall hand
- To correlate the fabric hand using this method and the existing method i.e. the (KES) and fabric assurance by simple testing (FAST)

Highlights :

The project work has been completed, the instrument is developed, response is quite encouraging from some of the renowned industries, the patent is already submitted.

Area of applicability :

Textile testing of fabric hand

Target beneficiaries :

- (1) Textile testing laboratories
- (2) Textile equipment developers

Contact Person : Director, NITRA **Location :** Ghaziabad

22. Title : Development & standardization of technology for improving aesthetic & comfort for operation on terry towel (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Need was felt to improve aesthetic and comfort properties of towels produced in decentralized sector.

Highlights :

Under this project various towel samples were collected from decentralized and organized sector and evaluated for physical & chemical properties. Reasons of poor quality of decentralized towels were investigated and finally ways and means were suggested to improve upon various properties.

Area of applicability :

Terry towel manufacturing technology

Target beneficiaries :

Terry towel manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

23. Title : Study on apron slippage in ring-frame & its effect on yarn quality and to develop systems to reduce it to improve yarn quality (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- To establish the phenomenon of apron slippage in ring-frame
- To study the effect of different factors on the extent of apron slippage
- To study the effect of apron slippage on quality of different types of yarn
- To develop systems to reduce the apron slippage for better yarn quality

Highlights :

NITRA developed a new type of apron i.e. "Anti-Slip Apron". The use of anti-alip apron in place of normal apron shows a total elimination of apron-to-apron slippage due to positive means of motion transmission from bottom to top aprons. As there is no apron-to-apron slippage in case of anti-slip apron, it can control the movement of floating fibres in a better way. Thus the use of anti-slip aprons improves the yarn quality.

Area of applicability :

Ring spinning technology

Target beneficiaries :

- (1) Apron manufacturers
- (2) Textile spinning units

Contact Person : Director, NITRA

Location : Ghaziabad

24. Title: Treatability on complete biodegradation of textile waste water through aerobic cum anaerobic route (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- Identification and development of a suitable microbial strain for the degradation of textile dyestuff
- Design and development of a bioreactor
- Analysis of textile chemicals and their biodegradability
- Evaluation of process parameters
- Techno-economic evaluation of the project and field trials

Highlights :

Bio-degradation of textile effluents for handling erratic effluent flow preferably by using Up-flow Anaerobic Sludge Blanket Reactor (UASB) is an attractive method of treatment because of its superiority in terms of energy, expenditure, recovery and low sludge generation. Special strains of microbes are being investigated and explored for their adaptability in Indian conditions. The anaerobic system has been preferentially chosen for the study as it is cost effective and would generate biogas in return.

An industrial plant to the tune of 2500 liter/day has been erected in the National Capital Region, which is working satisfactorily. The plant operates smoothly on the principle of up flow anaerobic sludge blanket reactor after slashing down the rudimentary color intensity through physico-chemical technique. This plant brings down COD value from 16000 mg/l to less than 250 mg/l as the anaerobic treatment is supposed to carry out reductive cleavage of reactive dyestuff during the treatment. NITRA has also set up a pilot plant to enlarge the periphery of application while treating the effluent with moderate level of COD/BOD load.

Area of applicability :

- (1) Use of up-flow anaerobic sludge blanket reactor (UASB)
- (2) Treatment of textile effluents

Target beneficiaries :

- (1) Textile wet processing industry
- (2) Effluent treatment solution providers

Contact Person : Director, NITRA**Location :** Ghaziabad**25. Title : Supply & installation of model ETP (Sponsored by Ministry of Textiles, Govt. of India)****Abstract :**

- Design and fabrication of two model effluent treatment plants having the following features :
 - Design capacity = 1 m³/hour
 - M.O.C. = mild steel
 - Suitable for intermittent process operations
 - Portable type/size of plant $\approx 3 \times 4$ m²
 - Very low operation/recurring cost
- Supply and installation of model ETP at -
 - M/s. Chenkumar Weavers and Handloom Society, Chennimalai
 - M/s. Sambalpuri Bastralaya Coop. Handloom Society, Bargarh

Highlights :

Two model effluent treatment plants have been designed, fabricated and commissioned at the respective sites. The beauty of the effluent treatment plant designed for M/s. Chenkumar Society, Chennimalai is developed of on-line mixer eliminating the conventional system for the total de-colorization of textile effluent with simultaneous reduction in COD/BOD load. The residual BOD, COD load has been removed by using submerged Aeration Fixed Film (SAFF) Technology.

The fixed film model would also help for the growth of a consortium of bacteria after necessary acclimatization period for the decomposition of complex molecules and residual dye-stuff if any escaped during the primary treatment. This needs future assessment of the plant within a year subject to continuous operation of ETP as per operation manual without any break. Investment cost of plant inclusive of transportation and consultancy charges is Rs.6.0 lacs only and treatment cost is Rs.3-4 per M³ (or KL) of effluent. The model ETP at M/s. Sambalpuri Bastralaya Coop. Handloom Society, Bargarh has been designed on similar principle.

Area of applicability :

R&D in effluent treatment plant technology

Target beneficiaries :

ETP manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

26. Title : Integrating organization information to meet out international business environment for the textile mills in next millennium (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Through this project, an attempt has been made to bridge the existing gap in the field of Information Technology. It understands business needs and tries to develop a need based ERP system for textile mills through designing and developing a user friendly software. The project integrates different levels of information for achieving goals and objectives of the organisation. It also uses information systems to plan, organize and control work with spirit to meet business objectives and achieve success in fierce competitive environment.

Highlights :

Under this project, different modules of software on MIS for spinning mills have been developed. The area of different modules comprises of material management, manufacturing process, sales, production planning, costing and HRM. A spinning mill from Northern India is taken as industrial partner to work on this project. Modules that have been developed currently comprises of maintenance management, quality assurance, engineering for spinning mills and dye-house. Various modules have been integrated to make one full fledged software.

Area of applicability :

- (1) Application in management information system
- (2) E.R.P.

Target beneficiaries :

- (1) Textile industry
- (2) MIS service providers

Contact Person : Director, NITRA

Location : Ghaziabad

27. Title : Development of process to incorporate elastane yarn (lycra) in a fabric to get body fit effect (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

- To develop a indigenous device to be attached on conventional ring-frame for manufacturing of elastane yarn
- To develop an elastane core yarn count measuring instrument

Highlights :

- Elastane core yarn attachment for ring-frame has been developed
- An instrument for count determination of elastane yarn has been developed

Area of applicability :

- (1) Body fit apparels manufacturing
- (2) R&D in stretch yarn

Target beneficiaries :

- (1) Weaving units
- (2) Testing instrument developers
- (3) Elastane yarn (lycra) producers

Contact Person : Director, NITRA

Location : Ghaziabad

28. Title : Development of U.V. resistant fabric (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

To protect the body from harmful UV rays of sunlight by developing suitable fabrics using chemicals, fibres and dyes.

Highlights :

A detailed literature survey on UV resistant fabric was completed. Relevant patents and papers were arranged. Chemicals (dyes and UV absorbers) arranged for preparing UV resistant fabrics, were tested for UV absorbance properties. Polyester cotton blended fabrics were treated with optical brightening agents, UV absorbers and suitable disperse and reactive dyes. Optical brightening agents and UV absorbers considerably improve the ultra-violet protection factor (UPF) of the fabric. Dyes also play major role in providing UV resistant properties of the fabric. Darker shade dyes impart higher protection against UV rays compared to lighter ones. UV absorber does not affect light fastness and colour strength property of dyed fabrics. UV absorber can be used with reactive dye and effect on colour strength, light fastness and UV protection factor (UPF) is the same when UV absorber is used separately. UPF of dyed fabrics

is not affected by exposure to light. Even after ten washings, dyed fabrics and UV absorbers treated fabrics have retained sun protection property. However, treatment of optical brighteners has not retained the sun protection property after washings. Fabric after treatment of UV absorber, retains mechanical properties like tensile strength, tear strength, crease recovery, air permeability and bending length.

Area of applicability :

- (1) Protective clothing technology
- (2) Dyes and UV absorber chemicals manufacturing

Target beneficiaries :

UV resistant fabric producers

Contact Person : Director, NITRA

Location : Ghaziabad

29. Title : Design, development and installation of model effluent treatment plant for handling erratic discharge from handloom processor at Weavers Complex, Delhi (Sponsored by Office of D.C. for Handlooms, Ministry of Textiles, Govt. of India)

Abstract :

- Standardization of the effluent from cotton processing in handloom sector
- To design and develop low cost energy efficient treatment plant for handling small volume of handloom processing effluent with erratic flow.
- Installation of the model effluent treatment plant in handloom processing unit at Weavers Service Centre, New Delhi

Highlights :

Handloom processing unit for installation of model ETP was finalized in consultation with Director, Weavers Service Centre, New Delhi. Process study was carried out for cotton yarn processing. The effluent sample from dyeing, scouring and bleaching operations were collected and analyzed in environmental laboratory. The effluent treatment scheme was finalized and a technical feasibility report was prepared and submitted to Weavers Service Centre and Office of the Development Commissioner. Detailed engineering drawing was prepared and submitted to Director, Weavers Service Centre, New Delhi for completion of civil work as it was in their scope of work. Detailed specifications of various components of model ETP were prepared. Fabrication of the plant as per NITRA design and civil work at site was completed. The plant was finally installed and commissioned at Weavers Service Centre, Bharat Nagar, New Delhi. The treated effluent samples were collected after operating the plant and were analysed in Environmental Laboratory. All the effluent parameters were found within the permissible limits for disposal of textile effluents.

Area of applicability :

- (1) E.T.P. manufacturing technology
- (2) Handloom processing technology

Target beneficiaries :

- (1) E.T.P. manufacturers
- (2) Handloom processors

Contact Person : Director, NITRA

Location : Ghaziabad

30. Title : Development of cost effective and eco-friendly bleaching of natural textile fibre using advanced oxidation technique (Sponsored by Deptt. of Science & Technology)

Abstract :

To develop an eco-friendly bleaching of natural fibers with minimum damage to the fibres and also to reduce the process cost of bleaching.

Highlights :

A semi continuous ozone bleaching machine was developed. Machine was used to bleach natural fibres such as cotton, wool and jute. The fading effect on Denim fabric was also created. A MOU was signed with M/s. Sara Elgi, Chennai for the development of continuous ozone bleaching machine.

Area of applicability :

- (3) Bleaching technology of natural textile fibres
- (4) R&D in oxidation technique

Target beneficiaries :

Textile wet processing units

Contact Person : Director, NITRA

Location : Ghaziabad

31. Title : Development of combined sizing and sectional warping for fine counts/single yarn for producing high priced cotton fabric for decentralized power loom sector (Sponsored by Deptt. of Science & Technology)

Abstract :

- To study the existing practices of sizing in decentralized sector
- To study the practices of sectional warping machine

- To develop a combined sizing and sectional warping system
- To test physico-chemical properties of sized yarn
- To study the performance of sized yarn on loom
- To study the economic feasibility of the developed machinery at the shop floor
- Training at the shop floor
- Transfer of the technology to the machine manufacturers

Highlights :

Sizing machine has been developed and installed at Tanda, U.P.

Area of applicability :

Sizing and sectional warping technology particularly for decentralized powerloom sector

Target beneficiaries :

Powerloom fabric manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

32. Title: Development of spray mist dyeing technology for hanks (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

To develop a semi-continuous low liquor hank dyeing machine where dye will be applied in the form of spray/mist on hank yarn.

Highlights :

Machine is fabricated.

Area of applicability :

- (1) Low liquor hank dyeing technology
- (2) Spray mist dyeing technology

Target beneficiaries :

Textile wet processing units

Contact Person : Director, NITRA

Location : Ghaziabad

33. Title : Industrial potential of milkweed fibre (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

To assess the physical & chemical changes in surface characteristics of milk weed fibre after having modified by treatment of different types of chemicals and optimize dyeing properties.

Highlights :

Preparation of various types of blended yarns with milkweed fibre is done.

Area of applicability :

Modification of surface characteristics of milkweed fibres by chemical treatment

Target beneficiaries :

- (1) Milkweed fibre producers
- (2) Textile technologists and scientists

Contact Person : Director, NITRA

Location : Ghaziabad

On-going :

1. Title : Development of personal protective textile using novel fibres (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

The crabyon fibre is developed with a blend of Chitosan and viscose. Chitosan is a product derived from Chitin, a compound of natural origin obtained from the shell of crab and shell fish. As Chitin/Chitosan is a built-in part of crab, so its antibacterial function stays unchanged against washing or abrasion for a long time. Its basic function is activation of Lysozyme and Chitinase enzymes which decompose cell membrane and inhibit growth of disease bacteria. This natural function of crabyon helps to keep bio system balanced and human body is protected against disease bacteria and toxic substances.

The X-static fibre has a layer of pure silver permanently bonded to the surface of a textile fibre. The process is such that the fibre with its silver layer retains all textile characteristics. Due to the silver layer, this fibre also provides excellent protection from microbial and bacteria.

Highlights :

This is considered that the fabrics produced out of blends of crabyon fibre and X-static fibre will be the best solution for the bacteria protection. Crabyon fibre has natural ingredient for bacteria protection while silver coating in X-static fibre exhibits very stable antimicrobial properties.

Area of applicability :

- (1) Application of new value added fibres in protective clothing
- (2) Optimization of process parameters in spg. of new technical fibres

Target beneficiaries :

- (1) Protective clothing manufacturers
- (2) Textile spinning units

Contact Person : Director, NITRA

Location : Ghaziabad

2. Title : Development of functional fabric to provide bacterial & ultraviolet protection to the skin (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Bamboo fiber is a regenerated cellulosic fiber produced from bamboo. Starchy pulp is produced from bamboo stems and leaves through a process of alkaline hydrolysis and multi-phase bleaching. Further chemical processes produce bamboo fiber.

Repeated technological analysis has proved that this kind of fiber has a fineness degree and whiteness degree close to normal viscose fiber and has a strong durability, stability and tenacity. Bamboo fiber and its blended fabrics are characterized by its good hygroscopicity, excellent permeability, soft feel, easiness to straighten and dye and splendid color effect of pigmentation.

Highlights :

In view of the above it is observed that bamboo fiber has some very good inherent properties as compare to cotton fiber, hence there is a strong need to create awareness and provide a knowhow to the textile industry about the manufacturing process of bamboo and bamboo/cotton blended yarns. The proposed project is aimed to address this issue and would be helpful to the textile industry.

Area of applicability :

Application of bamboo fibres in textiles used for skin protection

Target beneficiaries :

- (1) Textile spinning units
- (2) Protective clothing manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

3. Title : Optimization of process parameters to produce extra soft knitted fabrics for innerwear/kidswear by using high performance modal fibre (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Generally cotton fibres are used in the manufacturing of the knitted garments for inner wear/kidswear purposes. For kidswear and innerwear, extra softness is very much needed. But cotton fibre has certain limitations in terms of length, strength, lusture and the dyeability.

Rayon is a very versatile fibre and has the same comfort properties as natural fibres. It can imitate the feel and texture of silk, wool, cotton and linen. Rayon is easily bio-degradable.

Highlights :

Rayon is used in making apparel (e.g. blouses, dresses, jackets, lingerie, linings, scarves, suits, ties, hats, socks), furnishings (e.g. bedspreads, blankets, window treatments, upholstery, slipcovers), industrial uses (e.g. medical surgery products, non-woven products, tire cord), and other uses (e.g. yarn, feminine hygiene products, diapers). High Wet Modulus rayon (HWM) is a modified version of viscose that has a greater strength when wet and can be mercerized like cotton.

HWM rayons are also known as "POLYNOSIC" and has a trade name MODAL. The main idea behind this project is that a suitable blend ratio of the Modal and cotton fibres can be optimized and the comfort characteristics of the knitted fabrics can be evaluated.

Area of applicability :

Application of high performance modal fibres in knitted fabric manufacturing

Target beneficiaries :

- (1) Knitting units
- (2) Modal fibre manufacturers
- (3) Textile spinning units

Contact Person : Director, NITRA

Location : Ghaziabad

4. Title : Ultrasonic cleaning of garments (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

The present project aims at an alternative, environment friendly, garment washing technique that reduces the use of detergent and water drastically without affecting the quality of garment.

At present various types of washing machines are available in the market. The typical cleaning strategies depend upon the interaction of four factors: time, heat, chemistry of the detergents and force exerted during washing (mechanical agitation). For a given time to clean, force is dominant factor while chemistry and heat play supporting roles. Chemical detergent helps in wetting & separates the soil from the surface; heat, on the other hand, is used to speed up the process. A substantial amount of force is required to effectively wash off soil from the surface. This force is generated by agitation.

These washing machines work in a limited rotational speed due to this reason these machines are not efficient for complete removal of soil from the garments especially collars and cuffs. Further increase in speed by modification of machine design would give rise to damage to laundry articles.

Highlights :

Among various principles to enhance the intensity of physical force during washing (to improve the washing efficiency), use of mechanical energy obtained by cavitations phenomenon or nonlinear oscillation of micro air bubbles generated by sound waves (ultrasonic washing) appears to be the best as it can generate high amount of physical force in gentle fashion.

During the past 3 years NITRA has actively working in this field and developed prototype model of this technique. The results are very encouraging. The present proposal aims at expanding the current research activity towards developing a technique in the form of gadget, which can be installed on the existing washing machine to enhance its washing efficiency. After the development of this gadget, it will be demonstrated to commercial machine manufacturers for commercialization purpose.

Area of applicability :

- (1) Washing technology
- (2) Ultrasonic cleaning technology

Target beneficiaries :

- (1) Washing machine manufacturers
- (2) Washing machine users & launderers

Contact Person : Director, NITRA

Location : Ghaziabad

5. Title : Development of NYCO fabric for paramilitary and military combat uniforms (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Combat uniforms have special design and functional needs due to the wide variety of activities that the wearer is engaged in and environments that the wearer is exposed to. They must be designed to provide the wearer a wide range of motions in order for the wearer to perform a variety of activities. Additionally, the fabric used in combat uniforms and protective gears should provide some protection against known and unknown hazards such as cold & heat, chemical exposure and should also exhibit good breaking, tear and abrasion resistance for durability as well as air permeability. Further, the fabric must be capable of being dyed and printed for camouflage purposes.

Highlights :

The present project aims to develop stretchable Nylon 66 and cotton blended woven and knitted fabrics for combat uniforms of military and paramilitary soldiers where mobility, tear resistance, air permeability, abrasion resistance and other functional properties are desired. In USA and other developed countries NYCO (Blend of 50 wt. % cotton) fabric is preferred over polyester-cotton blended fabric. The nylon adds strength and abrasion resistance, while the cotton adds breathability and moisture absorption. To date, it's being used for military uniforms and high-performance sportswear. In India, at present polyester cotton blended camouflage print fabric is widely used in the military and paramilitary forces.

Area of applicability :

Combat uniforms and protective gears

Target beneficiaries :

- (1) Weaving units producing value added woven & knitted fabrics
- (2) Textile spinning units
- (3) Nylon 66 manufacturers

Contact Person : Director, NITRA

Location : Ghaziabad

6. Title : Waste minimization in shuttle-less loom (Sponsored by Ministry of Textiles, Govt. of India)

Abstract :

Invention of shuttle-less weaving techniques was a revolution in the field of quality fabric manufacturing. Lot of changes were done in the design of almost all motions. Mainly three systems of shuttle-less picking were invented and commercially accepted, namely – projectile, rapier and jet picking systems.

There are benefits as well as constraints in all these systems. Hard waste is always main problem of fabric manufacturers because it directly contributes to the cost of fabric. Rapier looms have false selvages at both sides of the fabric whereas air-jet looms have one side false selvedge as their inherent characteristics. Projectile looms, however, do not have false selvedge but use tuck-in device as inherent characteristics.

False selvedge is hard waste and is not useable in any other process of the unit hence increases cost of fabric. Out of all three systems maximum hard waste is produced on rapier looms and hence contributes considerably in cost of fabric.

Highlights :

It is useful to reduce false selvedge on rapier looms to produce cost effective fabrics. The proposed project is aimed to address this issue and would be helpful to the textile industry.

Area of applicability :

Weaving technology

Target beneficiaries :

Textile weaving units

Contact Person : Director, NITRA

Location : Ghaziabad

Industry sponsored projects

1. A study on comparative performance evaluation of AVS drive developed by Crompton Greaves with other conventional drives in ring-frame (Sponsored by Crompton Greaves Ltd., Delhi)
2. Treatability studies on textile effluent using a bio-reactor (Sponsored by M/s. Pali Water Pollution Control, Treatment and Research Foundation Common Water Treatment Plant, Pali)
3. Development of an equipment to determine deterioration of visibility due to smoke released on combustion of material (Sponsored by RSWM, Gulabpura)
4. Development of wick yarn for aeronautic purpose (Sponsored by m/S. Motilal Dulichand (P) Ltd., Kanpur)
5. Development of special cotton sliver for Swabs machine (Sponsored by Suparshiva Swabs (I), Delhi)
6. Development of garment printing machine for discharge printing by advance oxidation (Sponsored by M/s. Voltex Electrical Engineers, Ludhiana)
7. Comparative performance evaluation study of various makes of humidification system in textile industry (Sponsored by M/s. Luwa India Ltd. and NITRA)
8. Development and installation of boiler software for measuring boiler efficiency (Sponsored by M/s. Mordri Processors)
9. Development of X-ray opaque fabric (Sponsored by M/s. Surgiwear, Shahjahanpur, UP)
10. Development of water soluble filament yarn (Jointly with M/s. Zydex Industries, Vadodara)

In-house projects

1. A study on assessment of between splice variation and yarn splice profile for its influence on yarn quality
2. Re-use of polyester fibre dyeing waste liquor

3. In house project with students of various institutes
4. Treatment of water for textile industry
5. Waste management in wet processing unit of a textile industry
6. Eco-friendly textile processing : Substitutes for red listed dyes and chemicals used in textiles
7. Studies on removal, recovery and recycling of dyes, auxiliary chemicals and water in textile industry
8. An unconventional way to manufacture cost effective denim fabric
9. To study structural behaviour of natural coloured cotton and its application in delicate garments
10. Reduction of hairiness using lubricating formulation
11. Recycling of treated effluent water for dyeing of cotton with reactive dyes
12. Standardization of computer colour matching system for quantification of formaldehyde
13. A bio-chemical reactor for treatment of concentrated textile effluents
14. Scope of reusing primary sludge from textile E.T.P. as manure
15. A comparative study of modified bobbin holders viz-a-viz normal bobbin holders to assess its impact on yarn quality
16. Influence of thermal treatment on the properties of friction-spun core yarns
17. Effect of enzyme treatment on naturally coloured cotton
18. Surface modification of knitted fabric made out of rotor yarn
19. Characteristics of treated and untreated effluents from textile wet processing house
20. Development of healthcare garments with antimicrobial and blood repellent finishes
21. Effect of flame retardant on cotton fibre and fabric – A comparative study
22. Scope of reusing sludge from textile E.T.P. as manure
23. Recycling of concentrated textile wet processing effluent in dyeing of cotton with reactive dyes
24. Comparative assessment of terry towel from centralized and decentralized sectors

25. Discharge printing on direct and reactive dyed cotton made-ups : A new approach
26. Comparative assessment of fluorocarbon finishes for protection against liquid pesticide
27. Reutilization of acid dye liquor and chemicals in the dyeing on nylon
28. Improving hydrophilicity and softness of towels manufactured in decentralized sector
29. Optimization of process and process parameters of elastane based cotton knitted fabric
30. Development of antimicrobial and blood repellent polyester cotton blended dyed fabrics
31. Scope of Recycling and reuse of primary sludge from textile E.T.P.
32. Recycling of high TDS textile effluent in reactive dyeing
33. Development of a polymeric adsorbent for removal of reactive dyes from textile effluent
34. Study of the internal structure of compact spun yarn
35. Development of PLC based instrument to measure steam consumption for individual point/multi point application
36. Studies on removal of reactive dyes from aqueous solution by polymeric adsorbent
37. Studies on the estimation of polymers and organics in rubber compound by Thermo Gravimetric Analysis (TGA)
38. Development of fire resistant test apparatus
39. Studies on functional properties of terry towels developed by zero twist yarn
40. Development of technical yarn for thermal insulating fabric
41. Design and development of an instrument for measuring objectively the fabric hand (Sponsored by MOT, GOI for sponsorship)
42. Reduction of hairiness using lubricating formulations
43. Friction behaviour of textile
44. Apron slippage in ring frame
45. A survey on man-made fibre quality parameters

46. Effluent treatment : Removal, recovery & recycling of dyes, auxiliary chemicals and water in textile industry
47. An unconventional way to manufacture cost effective denim fabric
48. To study structural behavior of natural coloured cotton and its application in delicate garments
49. A study on inter-firm comparison of raw material and yarn quality for spinning mills
50. A survey on man-made fibre quality parameters
51. To study the effect of roving hank, roving T.M. and break draft on yarn quality parameters
52. Effect of roving strength and draft parameters on yarn quality parameters
53. Design and development of "NITRA Draftometer" for measuring drafting force of sliver and roving
54. Impact of heat treatment on DREF yarn
55. A comparative study of modified bobbin holders and normal bobbin holder to assess its impact on yarn quality
56. Development of composite industrial yarn for technical textiles
57. Study of internal structure of compact spun yarn
58. Chemo-metric studies on distribution of metals in Indian cottons
59. Development of special melton cloth for different types of balls
60. Design and development of an instrument for measuring frictional behaviour of fibres and fabrics
61. Design and development of draftometer for measuring drafting force of sliver and roving
62. Properties of woven fabrics containing DREF-III yarn, core and sheath components in weft
63. Development of PLC based instrument to measure steam consumption at individual point
64. Design and development of a processor for recycling of textile sludge
65. Development of PLC based instrument to measure air flow of compressed air at different points
66. Industrial potential of milk weed fibre

67. Studies on functional properties of terry towels being developed by using zero twist yarn in pile
68. Study on the estimation of polymers and organics in rubber compound by Thermo Gravimetric Analysis (TGA)
69. Development of an improved low liquor hank dyeing machine
70. Development of extra soft fabric from milkweed fibres
71. Development of "Terry-towel" by using zero-twist yarn
72. Development of technical yarn for technical textiles
73. Studies on functional properties of terry towel & knitted fabrics being developed by using zero twist yarn
74. Application of A.C. condensate in wet processing
75. Silk printing by advance oxidation technique
76. Quantification of flax-cotton blends
77. Dyeing of polyester with new method
78. Effect of atmospheric condition on dyeing behaviour
79. Optimisation of heat setting condition of lycra-cotton blended knitted fabric
80. Development of dye identification kit
81. A study of data mining and its application with special reference to textile industry
82. A new approach for dyeing yarn
83. Creating polyester characteristics on cotton and cotton characteristics on polyester by finishing
84. Study on fogging behaviour of automotive fabric
85. Cotton hank dyeing using unconventional technique
86. Cleanability & Soilability of automotive fabric
87. Selection of disperse dyes for automotive fabric
88. Software development to diagnose raw material (RM), M/c and Yarn performance
89. A study on application of aroma therapeutic essential oils finish on cotton knitted fabric by using micro-encapsulation technique
90. Comparison of various standard test method of colorfastness

91. A study on application of Vitamin-E and jasmine fragrance finish by using micro-encapsulation technique on cotton knitted fabric
92. Analysis of fogging behaviour of automotive textile material by different automobile manufacturer's test standards using spectrophotometer & gloss meter techniques