# 14. Details of On-going Research Programmes (MANTRA)

| S. No. | Title & Scope of the R&D project along with the sponsoring agency, if any | Name of the Project Leader | Year in which started | Estimated Cost (Rs. in Lakhs) | | | | | Brief write-up |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duration | Capital | Recurring | Total | F.E | |
| 1 | Development of Eco-friendly re-cyclable/ bio-degradable value added technical textiles from Banana Yarns.<br>**Scope:**<br>Banana fruit is grown in large quantities in India Banana pseudostem can be used to make value-added products which will generate revenue and utilize the pseudostem biomass. | Senthilkumar | 2009 | 2 years | -- | 27.18 | 27.18* | Nil | The objective of this project is to develop value-added products from banana pseudostem yarn, which is otherwise discarded as biomass waste. |
| 2 | Development of innovative fabrics made from PTT yarn and to set processing parameters for them.<br>**Scope:**<br>PTT is a new fibre, fabrics made of PTT will be studied for processing and performance properties. | M.G.Parikh | 2009 | 2 years | 2.5 | 31.16 | 33.66* | Nil | The advantageous properties of PTT fiber can be exploited. The developed fabrics will have better colour depth, softer feel, easy care properties, etc. |
| 3 | Development of Multilayer fabrics for Sportswear.<br>**Scope:**<br>Sportswear will be developed from a variety of Fabrics(multilayer) to optimize use of each type of fabric. | Dr.H.D. Joshi | 2009 | 1½ years | 0.3 | 48.38 | 48.68 | Nil | In this project sportswear fabrics will be developed using the multilayer fabric technology. Performance properties of the fabric will be tested. |
| 4 | Application of nano technology for delustering of Bright polyester fabric varieties.<br>**Scope:**<br>Nano technology will be applied to make nano $TiO_2$, for delustering of bright PET. | M.G.Parikh | 2009 | 2 years | 1.5 | 47.15 | 48.65 | Nil | A new technique will be developed for delustering polyester fabrics made from bright PET yarn. Nanotechnology is the technology of the future and this project will apply the latest technology. |

* Including 20% industry contribution.

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| 5 | Polylactic Acid fibres in technical textile Applications for packaging and disposable Food containers.<br>**Scope:**<br>The use of ecofriendly reusable PLA will be exploited for food packaging containers. | Dr.H.D.Joshi | 2009 | 2 years | -- | 27.38 | 27.38 | Nil | PLA is a natural polyester and is biodegradable. Food Packaging material (woven) made from PLA on conventional looms will be reusable and ecofriendly. |
| 6 | Development of cost effective filter fabric Suitable for bag filter.<br>**Scope:**<br>More durable and efficient filter fabrics will be made from combinations of yarns and tested. | Senthilkumar | 2009 | 2 years | 31.4 | 28.4 | 3 | Nil | Filter fabrics will be developed which are more efficient as well as economic and more durable as compared to filter fabrics used in industrial chimneys at present. |
| 7 | Development of Enzymatic technique for Weight reduction of polyester.<br>**cope:**<br>An ecofriendly technique for weight reduction Of PET will be developed by using enzymes Which are natural catalysts and ecofrinenly. | B..S.Pancholi | 2009 | 2 years | 2.1 | 32.3 | 34.4 | Nil | A new ecofriendly technique for weight reduction of polyester will be developed. This will reduce effluent load due to less consumption of chemicals. |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | Duration | Capital | Recurring | Total | F.E | |
| 8 | Development of Banana fabric suitable for extreme cold weather conditions by Plasma Technology.<br>**Scope:**<br>The thermal properties of banana fabrics will Be improved by application of plasma technology. | Senthilkumar | 2009 | 2 years | -- | 46.03 | 46.03 | Nil | Plasma technology will be applied to banana fabric to improve its thermal properties so that banana fabrics can be made suitable for extreme cold weather conditions. |
| 9 | Development of laminated products for inflatables.<br>**Scope:**<br>Laminated inflatables will be developed for Defence applications. | Senthilkumar | 2010 | 2 years | -- | 24.4 | 24.4 | Nil | The laminated inflatable products to be developed in this project are technical textiles which will find use in defence applications. |
| 10 | Development of Coagulation using modified Bentonite and recycle and reuse of effluent in Textile processing.<br>**Scope:**<br>An optimized technique of effluent treatment Using a natural clay, Bentonite, and Polyelectrolytes will be developed. | Gaurang Rana | 2010 | 2 years | 6.0 | 24.93 | 30.93 | Nil | Effluent treatment using this ecofriendly coagulant will be cost-effective as well as environment friendly concentration of Bentonite and other coagulants will be optimized for effective effluent treatment and reuse of treated water for textile applications. |

* Including 20% industry contribution.

**PROJECT TITLE:- DEVELOPMENT OF ECO-FRIENDLY RE-CYCLABLE/BIO-DEGRADABLE VALUE ADDED TECHNICAL TEXTILES FROM BANANA YARNS**

Banana fibre is extracted from banana psuedostem. Banana spun yarn was tested for physical parameters such as count, breaking load and %elongation. The average count of banana yarn was 1.06 $^{s}$**,** breaking load (kgf) 7.11 and % elongation, 6.1. Banana fabric was woven in five different weaves comprising, cotton/banana yarn twill weave, cotton/banana yarn satin weave, cotton/banana yarn + PET satin weave, cotton/banana yarn satin weave and cotton/banana yarn + viscose satin weave. Scouring experiments were conducted using alkali mainly $Na_2CO_3$ and Caustic Soda and non-ionic detergent on yarn and fabric. Bleaching trials were conducted with various bleaching agents like sodium hypochlorite (NaOCl), hydrogen peroxide and sodium hydro sulphite (hydros) and $KMNO_4$ on yarn and fabric. Dyeing trials were conducted with cold brand and hot brand reactive dyes in open bath as well as fabrics were dyed on jigger machine. The washing fastness of reactive-dyed Banana fabrics was evaluated. The washing fastness was found to be good (4-5). Finished / dyed samples coated suitably & products viz article leather, file cover, vertical blinds, jackets, caps etc

**PROJECT TITLE : POLYLACTIC ACID FIBRES IN TECHNICAL TEXTILE APPLICATIONS FOR PACKAGING AND DISPOSABLE FOOD CONTAINERS.**

PLA fibre/yarn is not manufactured in India and it was necessary to procure it from the nearest destination, China.. PLA fibres and PLA yarn were both procured from Chinese manufacturers/ suppliers. The PLA fibres were sent for spinning to SITRA. The spun PLA yarn, wound on bobbins, was then tested. PLA yarn was tested for mechanical parameters such as count, elongation, etc. The DSC of the both the PLA yarns (1 & 2) was carried out and the melting point of both PLA yarns was found to be 154ºC and 160ºC. PLA Gauze fabric: The PLA yarn was woven in to gauze fabric having Warp 39$^{s}$ PLA yarn and Weft 39$^{s}$ PLA yarn. The gauze fabric was given scouring and bleaching treatments. The scoured and bleached gauze fabric was finished using an antimicrobial agent and a stain-repellent agent. The PLA gauze fabric was tested for,antibacterial activity, Wicking property and Liquid Absorption Capacity. PLA fabric was woven to make food packaging bags. The PLA packaging bag were made according to BIS specifications for food packaging material. The PLA bags and fabric were tested for mechanical properties such as Breaking strength, Elongation and Tenacity.

## PROJECT TITLE:

### Development of cost effective filter fabric suitable for bag filter

A complete survey of available literature was made from internet available on the subject. Woven type glass fiber bag samples with acid resistance finish-750 GSM and without acid resistant finish-550 GSM from Envirocare Engineers & Consultant, Surat. Samples were tested for physical parameters, viz. Denier, Reed, Pick, GSM, TPM, etc. Further, we procured purchase the PTFE coated glass fiber fabric having 670 GSM of thickness 0.6 mm, width 1m, beige color & 470 GSM of thickness 0.4 mm, width 1m,beige color from M/s. UV Tech, Thane. Based on initial study and physical characteristics of fabrics tested, we have finalized the specifications of glass yarn to be procured & we have floated inquiry for procurement of glass yarn from different suppliers in India and overseas with the following specification for fabricating woven filter fabrics for bag house installed at coal/lignite boilers of approximate 5-8 TPH capacity and 10 PSI. We purchased and received the glass fabric A & B type, black, and brown type. We tested these fabrics in our labs. Two qualities of twill structure fabrics have been woven on Ruti loom in our Powerloom Service Centre and its quality evaluation is in progress.

## PROJECT TITLE : DEVELOPMENT OF ENZYMATIC TECHNIQUE FOR WEIGHT REDUCTION OF POLYESTER

Literature relevant to above subject was collected from internet and various books. Controlled samples were prepared by the conventional weight reduction process on commercial fabric varieties.. In this respect, different commercial popular polyester varieties,used for sarees and dress materials approximately 20 meters each were procured from the market and also procured chemicals/auxiliaries required to carry out conventional textile processes on the procured polyester fabric varieties. Grey---Drumming---Setting---weight reduction with caustic soda---Soda ash treatment---hot wash at 95ºC.---Acidic treatment in Jet machines at 120º C/30 minutes.---Final quality after achieving weight reduction.. Various combinations of chemicals and enzymes were used to study there effect on weight reduction of polyester fabric under study. In first initial trial overnight incubation at $37^0$C on orbital shaker was done with mixtures formulated in laboratory having varying concentrations of various components. After many trial and errors positive indications regarding weight reduction was achieved with Lipase + Amylase + very less concentration of KOH. The basic idea is to reduce the use of NaOH as well as KOH (chemicals) as well as to reduce the temperature in an effective way for processing of polyester fabrics.

## PROJECT TITLE:- Development of innovative fabrics made from PTT yarn and to set processing parameters for them

We succeeded in obtaining PTT yarn called Sorona yarn from M/s DuPont India.We received three different yarn as follows:150 denier, 144 filaments DTY, 75 denier, 72 filaments DTY 50 denier, 24 filaments DTY Above yarns were tested for physical parameters such as denier, strength, % elongation and tenacity. Out of these yarns 150 D DTY yarn was utilized for weaving into fabric. The yarn was subjected to twisting and steam setting under controlled condition. The beam was prepared and fabric was woven on plain power loom with plain weave. The fabric thus prepared was utilized for further processing trials. The prepared fabric samples were dyed with disperse dye at different temperatures viz. 95°c, 100°c, 105°c, 110°c, 130°c, in laboratory beaker dyeing machine. It was found that the shade obtained at 130°c was similar to the shade obtained at 105°c and 110°c. Hence there is no need to exceed that dyeing temperature. PTT fabrics were prepared in combination with viscose and nylon and processing trials were taken. The processed fabrics were printed and fastness studies were done. Weight reduction study was carried out with different of NaOH at 95˚C. 40D PTT yarn will be collected and subjected to preparatory process of weaving. Printing trial on PTT fabric and its evaluation vis-à-vis normal polyester fabric.

**PROJECT TITLE : DEVELOPMENT OF MULTI LAYER FABRICS FOR SPORTSWEAR.**

We have identified and selected and procured following fabric types: Nylon fabrics (defence wear & Tafetta fabrics), Polyester/cotton printed fabrics, Polyester fabric, Printed polyester fabric (military print), Black suiting lining, Printed cotton (yellow,)Cotton white. Membranes viz, polyamides PVA types & polyurethane have been selected & procured. **A**dhesives viz, polyamides and reactive polyurethane were selected & procured. Base fabrics were tested for physical properties, viz denier, strength, etc. On hot melt lamination machines fabrics were laminated using hot melt adhesives viz, EVA-370, Sikamelt 9600 & Swift Hamper 291. As regards hot melt lamination processes add on weight of adhesives was varies between 12 to 20 GSM. To make laminated product water proof upper layer of fabric were coated using polyacrylic coatings (solvent based products). Further to make the wear water proof breathable & stretch, fabrics are being procured the such as Nylon-spandex, polyester-spandex, cotton & viscose, mainly knitted varieties. In this regards the team has also visited manufacturing units & selected the fabric materials. This fabrics will be studied as inner material of sports garments.

## PROJECT TITLE:- Application of nano technology for delustering of bright polyester fabric varieties

Bright polyester fabric was procured from the local market. Chemical and auxiliaries required are also procured. For this project, homogenizer equipment is required to convert micro size $TiO_2$ particle into nano size $TiO_2$. $TiO_2$ micro emulsion was treated in ultrasound cleaner. Ultrasound is known technique for reducing particle size in emulsion. The bright polyester fabric sample was padded with ultrasound treated $TiO_2$ emulsion and cured at 200°c for 5 minutes. The result was compared with the same trial taken with $TiO_2$ micro emulsion without ultrasound treatment. The results show no appreciable effect of ultrasound on delustering. Aluminum Chloride can also act as delustering agent. Hence trial was taken with 40 g/l $AlCl_3$ concentration. The fabric was dipped in this solution and dried. It was then cured at 210˚c for 5 minutes.The results showed appreciable delustering but there was tonal variation. The colour became blackish may be due to liberation of acid.Meanwhile further laboratory trials with microfine dispersion of $TiO_2$ has been carried out. The trials has been conducted at 130 C & 135 C. The $TiO_2$ concentration has been varied & effect of ultrasound on delustering is also studied. The subjective analysis of treated samples for luster is underway.

**PROJECT TITLE:- DEVELOPMENT OF BANANA FABRIC SUITABLE FOR EXTREME COLD WEATHER CONDITIONS BY PLASMA TECHNOLOGY**

Literature survey with respect to plasma treatment and thermal resistance and water proofing has been done. We have procured 100% wool, polyester wool, polyester viscose and polyester wool is fabric. We have prepared 100% banana fabric from banana yarn on conventional loom. This fabric has been tested for thermal resistance on tog tester. Above mentioned wool and other fabrics has also been tested for thermal resistance on tog tester. 100% Banana fabric have been given desizing, scouring and bleaching treatments. The pretreated fabrics as above are being treated with atmospheric plasma treatment. The plasma-treated samples will soon be received from IPR, Ahmedabad. The treated samples will be tested for tog value and thermal conductivity. Samples with other variables will also be prepared and tested.

**PROJECT TITLE: DEVELOPMENT OF LAMINATED PRODUCTS FOR INFLATABLES.**

The objectives of this project are: To standardize and optimize the parameters viz, Mass. Thickness, peel strength, Gas barrier, tear strength, environmental properties etc. To study the properties of processed fabrics. Survey of available laminated products and their specifications have been obtained. Testing of these products. Fabrics for inflatables were developed in different constructions and fabric types. Physical properties of all fabrics were tested. Processing of developed fabrics. To test physical properties of all fabrics. To test specific parameters of developed fabrics

**PROJECT TITLE : DEVELOPMENT OF COAGULATION TREATMENT USING MODIFIED BENTONITE AND RECYCLE AND REUSE OF EFFLUENT IN TEXTILE PROCESSING.**

Bentonites (calcium & sodium base) were procured from local market. Polyelectrolyte (cationic, anionic & non anionic) were also procured from local market. For this project we have decided parameters to be tested which are pH, Total Suspended Solids (TSS) , Total Dissolved Solids (TDS), Oil & Grease, Chemical Oxygen Demand (COD), for both treated and untreated effluents. Initially, we have selected Bentonite of calcium base & cationic polyelectrolyte for the treatment. For this experiment we have selected the water samples of 'Sanya fashion industry'. First of all we have prepared 2% solution of Bentonite & 0.1% solution of polyelectrolyte for the treatment. Then 5% solution of Lime was also prepared for the treatment. Here bentonite was used as a coagulant & polyelectrolyte was used as a flocculating agent. Lime solution was used to adjust the ph 10-11. Here first of all we have used 50 ppm dosage of bentonite & according to it polyelectrolyte for the treatment. After treatment was given, parameters were checked of the water sample. Same treatment will be given to the water samples of other industries. Dosage of Bentonite and Polyelectrolyte will be increased with the same procedure. Further, we will use anionic polyelectrolyte & sodium base bentonite for the treatment.