

Conference Report

Fifty-eighth Joint Technological Conference of ATIRA, BTRA, SITRA and NITRA

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The 58th Technological Conference, jointly organized by the Ahmedabad Textile Industry Research Association (ATIRA), Bombay Textile Research Association (BTRA), the South India Textile Research Association (SITRA) and Northern India Textile Research Association (NITRA), was held at NITRA, Ghaziabad on 15th February 2019. Gen. (Retd.) V K Singh, Hon'ble Minister of State for External Affairs, Govt. of India, illuminated the 58th JTC as Chief Guest. Gen. Singh expressed happiness over the activities and achievements of the TRAs and advised them to develop marketable products so that buyers from world market rely on Indian textile products in preference to other countries. He also urged the TRAs to focus on technical textiles through Centre of Excellences (CoEs) that are established in TRAs. Sh. S K Kapoor, Chairman, NITRA, in his welcome address, mentioned that TRAs are the flag-bearers of textile research in India and are also acting as implementing agencies for Ministry of Textiles (MoT), Govt. of India. He urged the industry to provide more support to TRAs and create an environment so that TRAs can wholeheartedly concentrate on research works and pass on their fruits to Indian textile industry. Dr Arindam Basu, Director General, NITRA while presenting the *Combined Report on the Activities and Achievements of TRAs*, informed that in the year 2018 a large number of R&D projects have been conducted by TRAs. These researches are mostly funded by Government of India, but 30 % contribution for each research is borne by various private companies of textile industry. Hence, these researches are focused on practical solution on the industry's various problems or areas of improvements. Besides, many in-house researches are also undertaken based on the requirements of the industry.

In all, twelve papers, divided into three technical sessions, viz 'Technical & functional textiles', 'Fibre & textile manufacturing' and 'Water & utilities' were presented in the conference. First technical session was chaired by Emeritus Prof V K Kothari of IIT-Delhi. Dr M S Parmar presented paper on "Thermal and Moisture Transfer Performance of Fire-Fighter's Protective Clothing at Different Conditions". In this study, various types of outer shell fabrics, thermal barriers along with moisture barrier were used in fire fighter protective clothing assembly, and then clothing was tested before and after washing treatment for limited flame spread, convective heat, radiant heat, water vapour resistance (Ret) and heat transfer performance (HTP). The effect of dry and wet textile material on these properties were also compared. The study revealed that the material compositions and moisture content also affect the performance of fire fighter's protective clothing.

Non-fluorinated functional textiles is another important area where many researchers are working. Mr. S Shivkumar of SITRA conducted a deep study in this area and presented his findings in the paper "Durable Non-Fluorinated Functional Textiles Using Fumed Silica Sols". He briefed that the water repellency of cotton woven fabric was achieved by coating with an aqueous dispersion containing organosilane agent (HDTES), different polycarboxylic acid along with fumed silica and also commercial crosslinker namely tetraethoxysilane (TEOS). The coating agents were applied using pad-dry-cure method to allow the condensation reaction between HDTES silanol group and fumed silica silanol group, rendering silica particles hydrophobic. The water repellency evaluated by water contact angle determination, which showed the contact angle over the range of 145 to 150, was obtained in case of commercial TEOS cross linker with and without fumed silica (0.2% w/w). The effect of fumed silica

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addition on an increase in fibre surface roughness geometry showed the influential result in improving the water contact angle. The water repellency was in the range of 136° – 148° in case of aqueous dispersion made using organosilane agent (HDTES), polycarboxylic acids namely citric acid, salicylic acid and BTCA with fumed silica. The hydrophobic coatings evidenced from SEM and the adhering of hydrophobic coating to fibre surface, indicate the strong fixation of the fumed silica particles.

Another paper in this session was presented by Ms Neha Junare of ATIRA on “A Comparative Characterization of Isogrid Core with Honeycomb Core CFRP Sandwich”. She explained that Isogrid cores are constituted by a skin reinforced with a lattice structure. Combined with face sheets these cores form a sandwich structure, and such sandwich structures are adopted in aeronautical and space industries since they enhance both structural robustness and lightness. These structures were initially made of aluminum and were prone to thermal instability because of high coefficient of thermal expansion. Nowadays, composite materials are used in order to improve the lightness and thermal stability of such structures. Objective of this report is to find the different properties of core structure, in plane and out of the plane for different samples by experimental methods and CAD/CAE simulation. Detection of compressive modulus, compressive strength, shear modulus and shear strength have been attempted through experiment and by simulation in this study. Properties for isogrid core patterns will be inferred by experimental procedures which can be further utilized for structural stiffness and strength analysis of upcoming payload components.

For more than two decades, lot of work has been done on nanotechnology to have new and creative developments. Amol G. Thite *et al.* of BTRA have done studies on “Silver Nanoparticles Functionalized Cotton Fabric by Electron Beam Radiation Technology” and presented their findings in the session. They developed multifunctional cotton fabric by electron beam (EB) radiation induced *in-situ* synthesis of silver particles. In order to achieve multifunctional cotton fabric, initially cotton fabrics were padded with different initial concentration of an aqueous alcoholic silver nitrate solution and later on exposed them to different EB doses in an inert environment. The homogeneous and uniform fibre coating of silver particles with an average size of 81

nm was observed by SEM. The quantitative measurement of *in-situ* synthesized silver nanoparticles was estimated by inductively coupled plasma–optical emission (ICP–OES) spectroscopy and found to vary with concentration of the solution used for padding and EB doses, specifically more on the former. With this connection, synthesized silver nanoparticles produced visual colour change in cotton fabrics with light to deeper shade which could be controlled primarily by concentration of solution used for padding. A reflectance and transmittance spectrum in the UV–Vis region shows UV radiation blocking property of the fabric which also depends on the solution concentration used for padding. Treated fabric samples exhibited antibacterial behaviour against *S. aureus* and *K. pneumonia* microorganisms. Ultraviolet protection (UPF) and antibacterial properties durability were found good even after ten washing cycles, carried out as per standard washing procedure. This functional finishing did not adversely affect the air permeability and bending length properties of the fabric to a significant level but introduced a positive change of increased total crease recovery angle.

Second session “Fibre & Textile Manufacturing” was chaired by Prof R Chattopadhyay of IIT-Delhi. He summarized the four papers. There is great shift in the use of fibres i.e. from synthetics to natural due to several benefits of natural fibres, like eco-friendliness, biodegradability and skin friendliness. First two papers were on the use of unconventional natural fibres for the development of value-added products. Mr D Jayaraman of SITRA presented his findings on “Product Development Using Banana / Cotton Fiber Blends”. He explained that although ash content of banana fibre is high, the somewhat higher alpha-cellulose and lower lignin content indicate the potentialities of banana fibre for textile applications. His team has developed banana/cotton blended yarns with different compositions and made fabrics. Performance evaluation of banana/cotton blended yarns and fabrics with 100% cotton yarns and fabrics were carried out by evaluating their yarn quality characteristics and fabric comfort properties. The results indicated that the banana/cotton blended fabrics are suitable for making fancy garments and bed linen fabrics.

Another paper on natural fibre was presented by Dr Arindam Basu of NITRA on “Development of Value Added Products from Natural Fibres Produced

in Indian Himalayan Region". The Himalayan region has been bestowed with enormous fibre wealth, which has been used by the locals for their needs. NITRA has been involved in developing value-added products using the fibre extracted from pine needles and fibrous plants such as ramie (*Boehmeria nivea*), flax (*Linum usitatissimum*) and hemp (*Cannabis sativa*). It was found that the products developed from these fibres have very high export demand. Indigenous flax fibres have very good probability of replacing flax fibres, imported from European countries. Considering the huge demand of high value flax fibre garments, this can be a boost for the local people of Himalayan region.

A paper entitled "Study of Atmospheric Pressure Plasma Pre-Treatment on Polyester Fabric for Improved Polypyrrole Bonding and Conductivity" was presented by Ms. Smita Deogaonkar Baride of BTRA. Investigations have shown that all plasma treated fabrics exhibit better hydrophilicity. It was also found that both highest conductivity and strongest interfacial bonding (improved adhesion) were achieved by helium-oxygen plasma pre-treatment. This plasma treatment leads to increase in surface functionalisation of polyester fabric by formation of carboxylic groups on polyester substrate.

Mr Hasmukh Patel of ATIRA presented a paper on "Study on Operator Workload and Interference Loss in Airjet Loomshed – Case Study". The study, conducted on the weaving operators, independent of helpers, relievers, etc., was based on running sorts in the airjet loomshed of a weaving mill. The workload assessed, of the weaver, was based on time and motion study for the number of looms assigned. The loomshed efficiency and productivity of the loomshed for the set of looms allotted were also monitored. The various work elements in the workload assessment study, which included time to attend to stops/breaks, to walk, to patrol, and to make tail ends were observed and compared against standardized time. The impact of interference losses on the workload was also observed.

Mr M K Garg of Alps Industries Ltd. chaired the third technical session. In this session, first presentation was on "Surface Modification of Cotton Fabric to Dye it Using Disperse Dye to Conserve Water" by Ms Nidhi Sisodia of NITRA. A new approach was developed to dye cotton fabric using disperse dye. Cotton yarn was first treated with resin like a sizing. This treated yarn was then directly taken for weaving. The fabric was then dyed with disperse dye without

doing any pretreatment which have been used for cotton dyeing. The dyed fabric has given unique fancy effect like enzyme and stone washed denim. This new approach of dyeing saved lot of water and energy as compared to conventional process of cotton fabric dyeing.

Another paper on "Nanofiber Coated Prefabricated Vertical Drainage (PVD) Membrane with Improved Anti-Clogging Property" was presented by Dr Prasanta K Panda of BTRA. Results showed that the use of nanofiber membrane rather than only nonwoven membrane, significantly improves anti-clogging property. The presence of soil particles in the membrane pores was checked by SEM after use.

Next paper on "Study of Textile Wet Process to Reduce Consumption of Water and Proper Mercerization Process to Control Consumption of Caustic Soda – Industrial Case Studies" was presented by Dr K C Gupta of ATIRA. Proper process can reduce the consumption of water in textile processing considerably. The mercerization process is followed extensively in cotton textile industry. In this study, the proper process of mercerization is given. Improper mercerization is causing lot of pollution due to caustic and other chemicals.

Concluding paper entitled "Study of Ring frame from Energy Efficiency Perspective" was presented by Mr N Vasanthakumar of SITRA. In today's market conditions, achievement of lowest possible raw material, energy and labor costs and waste levels are necessary to maintain good profit margin levels in spinning mills. The above state of affairs has triggered a healthy competition among spinning machinery/ ancillary equipment manufacturers in enhancing the performance of their machinery in terms of production levels, quality, energy efficiency and lower waste levels. Since ring frame machines still account for 55%-60% of total energy consumption of a modern spinning mill, this paper has its special focus on the energy consumption / efficiency of modern ring frames and the impact of technologies such as link coners, auto doffing mechanism, compact spinning systems, bobbin transport systems, spindle monitoring systems etc., on the specific energy consumption (UKG) of ring frames. Emerging energy conservation trends in ring frames and their future prospects were also discussed.

Conference was concluded by Dr Arindam Basu, Director General, NITRA with the hope that R&D will always remain the backbone for any industry to progress and prosper particularly the textile and apparel sector.