ABSTRACT

Textile industry is continuously searching for new technologies to satisfy the consumer’s changing demands and requirements. Newer designs are being introduced to cater to the changing fashion trends. With the development of new fabrics, new weaving and finishing techniques, technology has become more systematic in modern times. The fabric and design development in jacquard weave is primarily based on creative science of textile technology. The art of jacquard weaving signifies man’s aspiration to combine beauty with utility. Jacquard fabrics of cotton are highly durable, comfortable and good conductors of heat. Fabrics of almost any type or complexity can be made using jacquard loom. Jacquard is universally used in the industry for production of large figure designs. Jacquard fabrics with unique combination of low cost, easy washing ability and comfort characteristics have made it superior to other materials like summer clothes, work clothes, sheets and towels. Similarly, Modern performance fabrics are required in many specialist applications which need to exhibit high degrees of performance in terms of longevity and durability, and should impart antibacterial, Water-repellent, Soil Release, flame retardant, mosquito repellent properties to the fabric.

In this background the present study entitled ‘Design and development of jacquard fabrics with multifunctional finishes’ is aimed to design and develop jacquard fabrics with multifunctional property. A market survey was carried out in 50 leading jacquard fabric manufacturing units in order to find the availability of the furnishing items made of jacquard designs, details about jacquard fabrics such as colour, size and type of jacquard fabrics which includes bed sheets, mats, pillow covers, floor mats, curtains, cushion covers, tea towels, decorative mats and shirting in the market. From the consolidated results of market survey, Cotton dyed yarn of 30’s count jacquard weave with animal and floral design was selected for the present study. A total of 90 meters of jacquard fabrics was woven, six meters each in five designs from each set of jacquard fabrics were selected for the weave and changes were made in the tie up of the treadles.
The jacquard samples were finished with the antibacterial agent “Quaternary ammonium compound”. Based on antibacterial activity results of 15 fabrics, only six samples were taken for further studies. The functional finishes such as water repellent finish, flame retardant finish, stain release finish and mosquito repellent finish were given using finishing agents and the efficiency of each finish on the fabric was tested according to the standard methods.

The water repellent finishing agent “Elastomeric (Polydimethyl hydrogen siloxane) compound” was used in combination with “Acetoxy Silanes” in the ratio of 100:5. The finished fabric was tested by spray method (AATCC- TM 22-2010) which showed 90% efficiency in all the six samples.

The flame retardency was tested using flame retardant finishing agent “Tris(2-Chloroethyl) phosphate”. The flammability was measured as the length of char in mm and it ranged from 3 mm – 6 mm. The stain release finishing agent “Perfluoro octane sulfonic acid” was used to impart stain release property to the jacquard fabrics. The finished fabric was tested for its stain release property by AATCC 130-2000 test method which was found to be in the range of 4 - 8 grades. Similarly the fabrics were finished with Lemongrass oil to impart mosquito repellency to the fabrics. The mosquito repellency efficiency of the finished fabric was tested using the modified excito chamber method and in the range of 84-92 percent. Physical properties such as fabric weight, tensile strength, abrasion resistance and fastness properties like colour fastness to light, fastness to washing, fastness to perspiration and colour fastness to crocking of individual finished jacquard fabrics were tested by standard methods (ASTM 110, AATCC 16, D 5034–95 2001, AATCC-61, AATCC-15 and AATCC-8). The characteristics of the individually finished fabrics were tested and the results were compared with the control (unfinished) fabric by Fourier Transform Infrared Spectroscopic analysis (FTIR) and Scanning Electron Microscopic analysis (SEM).

Similarly, an approach of multifunctional finish to a single fabric was done using a series of bath containing the commercial finishing agent as mentioned above.
The durability of multifunctional finished fabric samples was tested after different wash cycles. The washed samples were tested for the retention of functional properties after every 2, 5, 10, 15 and 20 launderings using standard test method (AATCC 124-1996).

The characteristic of the jacquard fabric after each finish was subsequently studied through Fourier Transform Infrared Spectroscopic analysis (FTIR) and Scanning Electron Microscopic analysis (SEM).

With this, multifunctional finished jacquard fabrics and health care products such as bed sheets, pillow covers, and curtains have been developed. These were given to the consumers and home textile manufacturers for evaluating the design created, colour chosen and the application of multifunctional finishes to the newly developed novel designed jacquard fabrics. This novel concept of healthcare product will provide new scope in the near future. Since multifunctional jacquard fabrics can effectively be used for production of value added products and it has an edge in the competitive global market.