ABSTRACT

Textile field is an ever developing field that brings a lot of application in various other fields. In a country like India, there are varieties of people using textile products and the need is more. The deep analysis of the researcher resulted in a new technical approach to modernize the development of textile products by recycling, there by reclaiming the usage and bringing more profit to the society, thus satisfying individual needs. To make it crystal clear, recycling is the process of making or bringing out new products from a product that has originally served its purpose. If the used products are disposed of in an appropriate, environmentally friendly way, then the process of recycling sets in motion. Recycling gives a positive impact on the world in which all human beings adhere to. So it is the duty of every human being to act fast as the waste is increasing day by day. The relevancy of the research elucidates that textile recycling is the method of reusing or reprocessing of used clothing, fibrous material and clothing scraps from the manufacturing process.

Through this research, an attempt has been made to implement an innovative technique for developing non-woven composite using reclaimed fiber. Textile wastes are generally classified according to their manufacturing process. They include spinning process waste, soft waste, hard waste, knitting / weaving process waste, and apparel processing waste. In this study, knitted process wastes are used as raw materials. The most widely accepted reclaimed fiber preparatory method is 'mechanical re-fiberisation'. So a fabric opener has been designed and a model was developed by the above mentioned preparatory method for converting the raw clothing into reclaimed fibers. The reclaimed fiber is then collected in a vacuum assisted drum and fed out of the machine. The structure of the newly invented textile re-fibers influences the

dimensions, degree of separation and homogeneity of the fibrous product. The reclaimed fiber properties like fiber strength, length, fineness and uniformity ratio were tested as per the ASTM (American Society for Testing Material) test method. The test result showed that the reclaimed fiber properties are suitable for making thermal and chemical bonded non woven fabrics. The reclaimed fibers are then converted into web or lay conversion using conventional carding machine. After the conversion of lay or web, the non-woven is manufactured by two techniques; namely thermal and chemical bonding methods.

Through this research work thermal bonding method is applied generally to high loft structures to get homogenous bonding. In the impingement method (another name for through - air bonding), the web is transported to the oven and from the nozzles hot air is impinged to the web surface and thereby bonding formation occurs. Using cotton and polyester reused fibers produced from “reused fabric opener machine” six thermal bonded non-woven samples of different combination like cotton and polyester white and cotton polyester colour combination were produced. The thermal bonded non-woven properties like thickness, areal density, bulk density, air permeability, fabric porosity, thermal conductivity and sound absorption behavior were found out by ASTM standard test method. The above result clearly shows that the thermal bonded non-woven properties are well suited for the development of composite material, for the application of sound absorbing material.

An another attempt has been made in this research using chemical bonding method which is a versatile technology and fabric formation is made by the spraying of resin or latex PVA (Poly Vinyl Acetate) to the structure. The characteristics of the latex used for bonding non-woven are very important because of their effects on performance of the non-woven. It is

suitable for the bulky, high loft applications that provide resiliency and softer hand to the fabric. Using cotton and polyester reused fibers produced from "reused fabric opener machine" six chemical bonded non-woven samples of different combination like cotton & polyester white and cotton polyester colour combination. Chemical bonded non-woven properties like thickness, areal density, bulk density, air permeability, fabric porosity, thermal conductivity and sound absorption behavior were measured using ASTM standard test method. The chemical bonded non-woven properties results indicated that the non-woven is good enough to make composite materials.

Through this research work nine best sound absorption composite materials have been developed like thermal and chemical, cotton polyester colour and white and blend of cotton & polyester materials. The developed composite material properties such as thickness, density, fiber volume fraction, maximum stress, strain at maximum load, and strain at failure, stiffness, moisture absorbency, tensile strength and flexural modulus were measured through ASTM standards. The above test properties influence the sound absorption behavior of the composite material.

This research also offers an insight into the body of knowledge on the sound absorption properties of composite materials using reclaimed fibers, and provides a better understanding over the effects of manufacturing process. This research also paves way for the upcoming researchers to fine tune their ideas on reclaimed fibers for various applications.