ABSTRACT

Acoustic absorption property is an important aspect of any material meant for acoustical environment, which decides the human comfort. Noise control and its principle play a critical role in creating an acoustical pleasing environment. An important feature of any acoustic textile material is the absorption of sound, which makes the human being comfortable. Hence, acoustic absorption can be viewed as controlling the intensity of sound (or) noise in a living place using different types of acoustic absorbing materials. Reflection, refraction, absorption, diffraction and interference are the critical factors to assess the performance of textile materials with respect to acoustic absorption. The influence of absorptive characteristics of textile materials has a significant result in acoustical comfort.

Noise is an unpleasing sound and unfortunately most of the equipments in industries, high speed vehicles and other facilities produce noise. The noise system consists of three elements such as noise source, noise path and noise receiver. These three are the essential factors to be considered for the noise control, one of the methods is by providing absorbers along with the noise path, resulting in human comfort.

Fibrous, porous and other sound absorbing materials have been widely used as acoustic controlling materials. A literature scan showed that many varieties of textile materials could be used effectively for acoustic

absorptive materials. The main role of the acoustic textile materials is to absorb the sound energy and convert it into thermal energy.

The main aim of this research work is to study the drawbacks contributed by the existing acoustic absorbing materials such as felts made from glass fiber, asbestos, rock wool and foams. The main drawback of these materials is unsuitable for the process of the manufacturing acoustic felts such as opening, bonding and molding. The raw materials used for the manufacturing of existing acoustic felts are hazardous, non recyclable and difficult to handle during manufacturing process. The present research work focuses to solve these drawbacks by developing the acoustic absorptive materials using eco friendly textiles and to study their characteristics.

Through this research work an attempt has been made to develop novel adhesive bonded nonwovens produced using recycled fiber, coated woven and knitted fabrics. Their acoustic absorptive characteristics are to be critically analyzed based on various textile materials and their structural modifications.

The influence of material variable on acoustic absorption of nonwovens produced from recycled fiber is carried out to find the suitable recycled fiber nonwoven which gives maximum level of acoustic absorption. In order to study this influence three different recycled fibers adhesive bonded nonwoven of cotton, viscose and polyester were produced for acoustic absorption. The sound resistances of the developed products were also measured by a novel sound insulation testing method. The nonwoven

developed from recycled polyester had given the optimum acoustic absorption and sound resistance.

The influence of the structural characteristics on acoustical and sound resistance of the developed nonwovens like thickness, density, air permeability, porosity and backing cloth were also measured and interpreted. The increase in thickness of the nonwoven increases the acoustical behavior. The nonwoven produced with backing cloth shows higher acoustic behavior than that of nonwoven without backing cloth.

Coated woven fabrics of linear densities 20Ne, 30Ne and 40Ne in warp and weft of cotton, viscose and polyester with different structures were developed with pad-dry -cure coating and spray coating methods and tested for acoustic absorption and sound resistance. The acoustic absorption results of spray coated fabric are higher than that of pad-dry-cure coated fabrics. The fabric woven with 40Ne showed maximum acoustic performance.

Coated knitted fabrics of linear densies 20Ne, 30Ne and 40Ne with different structures of cotton, viscose and polyester were developed with pad-dry-cure coating and spray coating methods and tested for acoustic absorption and sound resistance. The results of spray coated knitted fabric with 40Ne showed higher acoustic performance.