STUDY OF POLYESTER HIGH LOFT TEXTILES FOR THE ACOUSTIC AND THERMAL INSULATION APPLICATIONS

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ABSTRACT

In recent times there is new interest for polyester fibre in the light of growing global concern for environmental preservation and control of pollution. Polyester and allied fibres can certainly be considered as a high potential source for new product development. Growing market for polyester fibre based industrial applications offers new possibilities for polyester fibre. In order to meet the challenge in this area, products made out of polyester fibre should adopt new technologies for industrial applications. The potential of Polyester fibres is not at all exploited fully for development of nonwovens, although the mechanical characteristics of these fibres are very encouraging. Polyester fibre automatically becomes eligible for various end uses as it has much higher relative strength, availability, cost competitiveness as compared to other bast fibres for producing cost effective nonwoven products. This thesis work addresses all these aspects in order to have a better alternative way for making products using Polyester fibre. Highloft textiles are one such area in which the Polyester fibre can be used effectively. New processes of making highloft textiles using nonwoven technology will lead to better working conditions. A comparison with the traditional textile production shows, that the new applications are offering also very attractive opportunities to invest and growth for Indian polyester industry. In this research work the polyester fibre was blended with polyester and low melt bi-component fibre and highloft textiles has been developed for various applications and studied. It is found that polyester fibre based highloft textiles possess better acoustic and thermal insulation properties, the developed highloft textiles will surely act as a substitute for synthetic acoustic and thermal insulation products.

Keyword : *Highloft textiles, pollution, relative strength, nonwoven technology, acoustic and thermal insulation*

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1. INTRODUCTION

The future consumption of Polyester fibre in classic textiles looks rather optimistic, the nonwovens offer even greater opportunities in technical applications. The nonwoven technologies have been developed mainly in the countries linked with rapid growth in synthetic fibres. Further, attention is focused on the wide utilization of Polyester fibre in nonwoven industrial fabrics. In nonwovens, the Polyester fibre can be utilized either pure or blended with other synthetic fibers. In some technologies other synthetic fibers are a necessary component of a fibre blend such as through-air bonding. In other production technologies these improve the functional properties of fabric materials. In this research work polyester fibre based highloft textile samples were produced with different blend composition and its potential for various applications has been thoroughly studied. Objective of the project work is

- To produce high loft material using polyester fibre. Production of high loft material using STRUTO (Vertical laid and thermal bonding) technology.
- High loft textiles produced using polyester fibre and low melt PET(which acts as binder for the high loft material).
- To analyze the effect of GSM of high loft material on the acoustic and thermal insulation behavior and to investigate the compression and recovery behavior of produced samples.
- To analyze their sound absorption property for acoustic applications.

2. BACK GROUND OF THE WORK

Technical textiles can be summarized as textiles that are used for specific applications in agriculture or in sectors such as the automobile, aviation, civil engineering, chemical, electrical, leather, medical and transportation industries, or for environmental protection. The main features of technical textiles are rated on specific performance parameters and not on aesthetics. Polyester fibre has some unique physical properties such as high tenacity, bulkiness, sound and heat insulation properties, low thermal conductivity and antistatic properties. On account of these qualities, polyester fibre is more suited for the manufacture of technical textiles in certain specific areas. Nowadays, polyester fibre is being used in high-performance applications such as protective textiles, composites and automotive textiles. Excellent results have been reported by researchers who studied the processing of Polyester fibre for nonwoven and technical textile applications.

HIGHLOFT TEXTILES

Krema et al. (1994), Kucuk et al. (2012), Krema & Jirsak (1990) explained that highloft textiles such as filling materials, precursors for molding processes, thermal insulating materials and sound absorbers are in development. Production of highloft textiles by perpendicular layering carded web and through-air bonding is one of the newest methods in the highloft sector.

Parikh et al. (2002) found that low cotton-content highlofts containing up to 20% cotton have a compressional behaviour and dimensional stability similar to 100% synthetic fibre fabrics. These low cotton-content highlofts are economical to produce and have improved biodegradability.

Parikh et al. (2004) constructed highlofts from cotton, polyester and bicomponent bonding fibres and found that compared to cross-laid fabrics, perpendicular-laid fabrics confirmed higher elastic properties and superior compressional resistance.

Rohit Uppal et al. (2012) studied the flame retardant treated grey cotton fibers by blending with antibacterial treated grey cotton fibers and polyester/polyester sheath/core bicomponent fibers to form high-loft fabrics.

BULKY NONWOVENS (HIGHLOFT)

The European Disposables and Nonwovens Association (EDANA) defines a nonwoven as ‘a manufactured sheet, web or batt of directionally or randomly orientated fibres, bonded by friction, and/or cohesion and/or adhesion’, but goes on to exclude a number of materials from the definition, including paper, products which are woven, knitted, tufted or stitch bonded (incorporating binding yarns or filaments), or felted by wet-milling, whether or not additionally needled.

Highloft textiles are termed as bulky nonwovens, they are defined as low density bulk fiber structures with high thickness ratio of the basis weight. While the fibers may be finite or infinite, bonded or un bonded. The bulk fabric contains no more than 10% of the solid component in of the whole volume and their thickness is greater than 3 mm.

The bulkiness of these materials influences the consumption and utilization of fibre raw material, compressibility, acoustic and thermal insulation properties. Bulky fabrics are most commonly used in upholstery, as liners and stuffing materials (clothing, sleeping bags, blankets) as structural and reinforcement materials, insulation (thermal and acoustic) and healthcare. Usage depends on the technology of producing the fibrous web and the method of its consolidation. Holiday (1995), Krema et al. (1997), Baigas (1998).

The description about the production of bulky nonwovens, ¬ the use of suitable material, production technology and the method of reinforcing the fibre and other important factors that affect the quality and usability of the product to a large extent ¬ is mentioned.

When producing bulky nonwovens most commonly used two procedures for matt formation:

- Mechanical fabrication of the web
- Aerodynamic creation of the web

Aerodynamically, the isotropic character of the products arises. In the mechanical creation of the web, the spider web coming from the carding machine is characterized by an anisotropic fibre arrangement. Efforts to improve the properties of the nonwoven fabric in compression resulted development of manufacturing technology, perpendicular laid textile called “STRUTO”.

MANUFACTURE OF BULKY NONWOVEN MATERIALS

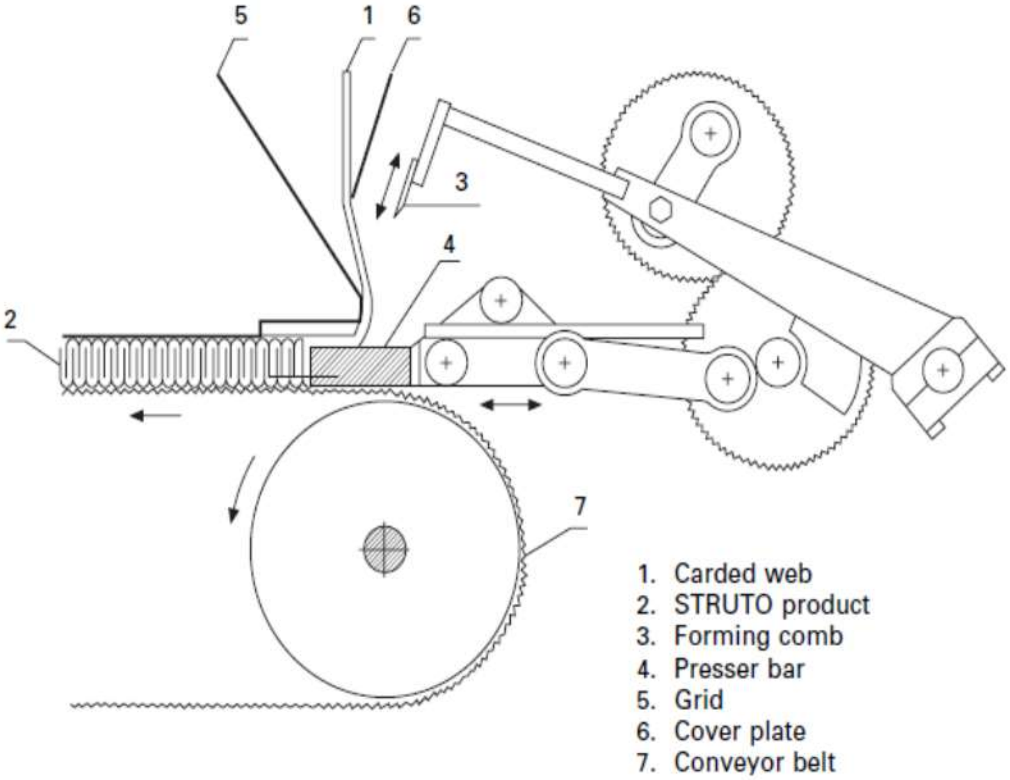
Perpendicular technology

For the manufacture of perpendicular layers, two devices were developed: a rotary perpendicular roller and a vibratory vertical punch, which is more commonly used. Krema et al. (1994).

Vertically lapped (perpendicular-laid) web formation

Vertically lapped (perpendicular-laid) nonwovens are gaining acceptance in an increasing number of applications. Such bulky nonwoven materials are used as foam replacement materials in the automotive industry, depth filtration media and acoustic/thermal insulation. Various methods of corrugating webs to form perpendicular-laid fabrics have been devised over the years and they all produce a concertina-like, three-dimensional structure, which after bonding exhibits high recovery from compression. A carded web, which normally contains a proportion of thermoplastic fibre, typically a bicomponent, is formed into a series of vertical folds that are stabilised by through-air thermal bonding. Blends may be composed of thermoplastic synthetic fibres, reclaimed waste materials and natural fibres such as cotton and wool. In addition to fibre composition, the fold frequency, (which influences packing density) and the fold orientation affects fabric properties. The fold frequency and orientation are controlled by the choice of lapping device and the web overfeed setting. The Struto system (Struto International Inc.) is an established perpendicular-lapping process, shown in Figure 2.1.

Upright position of fibers shows many differences in properties towards materials produced by cross-laid and air-laid textiles, where the fibers are mainly oriented parallel to the fabric plane as mentioned in Figure



A reciprocating lapping device is used to continuously consolidate the carded web into a vertically folded batt immediately prior to through-air bonding. A proportion of low-melt thermoplastic fibre in the blend enables thermal bonding of the structure either in its basic lapped form or in conjunction with a scrim or support nonwoven material, which can be introduced before the oven. Thereafter the Struto material is cooled and subsequently wound.

Slitting the fabric in a similar manner to woven carpets to make two separate materials produces thin Struto fabrics. The compression properties of the fabrics are strongly influenced by the proportion of thermoplastic bicomponent fibre present and the fibre diameter, which governs fibre rigidity. Stiff, board like products are produced using a high proportion of coarse component fibre (>5 dtex). Depending on composition and nonwoven structure, the materials have higher resistance to compression and elastic recovery in highloft textile.

To maximise the resistance to compression-recovery properties, vertical orientation of the fibre in each web fold is usually preferred instead of a slightly inclined orientation. Highloft textiles from struto technology are used in a variety of applications including foam replacement materials, sound insulation in automotive interiors, thermal insulation, bedding products and air filtration.

In the case of thermal bonding, the STRUTO fabric comprises two types of fibers - the base fibers and the binder fibers (usually 15-30%). All commonly used thermoplastic fibers (PP, PA, coPL) are used as binder fibers. The optimal distribution of both types of fibre is important so that the resulting product is as uniform as possible. Many such studies were carried by (Oldrich Jirsak et al. 1996; 2001; Takahashi 2001; Saskova et al. 2003).

COMPRESSION BEHAVIOR

Van Wyk (1946); Dunlop (1983); Young et al. (1985) have carried out numerous studies on the compression properties of loose fibre masses. Under compression fibres composed of viscose, acrylic, polyester and wool performed differently.

In many applications nonwoven fabrics are used for their bulkiness. Especially in the field of geo-textiles Kothari & Das (1992), home upholstery, automobiles, insulation, sound absorption materials, etc. For these end uses, the compressional behaviour is an essential property which decides their behaviour for utilization. The review of the literature specifies that a large number of studies have reported the compressional behaviour of fibre masses and to a limited extend nonwoven materials.

Fibre properties in these deformations must be measured using single fibre. These properties have not been clarified expect the extension property and some torsion experiments for many years in spite of long history of textile research, Sueo Kawabata (1998).

Hearle, Thwaites & Amirbayat (1980, 1999) Bending generates strains in a fibre, for small deformations bending involves pure axial extension/contraction, Bending has a large effect on the compressional properties of textile materials especially in highloft nonwovens, were the recovery of the material to its original position after deformation depends mainly on the bending properties of fibres was stated by Van wyk (1946).

Peirce (1930) theory presents the bending effect on textiles, which consist the theoretical fundamentals on which most of the static measurement of bending rigidity are based. Numerical analysis of Peirce's test was also carried out. The numerical analysis was concerned with deflections of heavy elastica of a given bending rigidity was studied by Szablewski & Kobza (2003).

Chaudri & Whiteley (1968); Fok & Finzel (1956) studied the influence of variations in wool fibre and other staple fibre properties for compression as it plays an important role in compressional properties of textile materials.

Oldrich Jirsak et al. (2002) mentioned that due to vertical position of fibers, the STRUTO nonwovens (highloft textiles) show outstanding compressional rigidity and a high degree of recovery after repeating loading. Compressional curves of various high loft materials are compared in Figure 2.3 Comparison of the load vs. thickness and elastic recovery behaviour of 150 g/m2 Struto fabric produced from thermoplastic synthetic materials compared with other nonwoven materials.

ACOUSTICS

Aso et al. (1964) Absorption of unwanted noise is mainly based on dissipation of energy of the sound wave due to viscosity and heat conductivity of the medium and also it depends on the fibrous structure. The nature of fibre, length, fineness, the surface characteristics, elasticity of the constituent fibres, the porosity, the fibre orientation, thickness of the assembly and many other several factors determine the sound absorption characteristics of fibre assemblies.

Beranek et al. (1992); Parikh et al. (2006); Thilagavathi et al. (2010); Al Rahman (2012), mentioned that, almost all materials have some amount of sound absorption property, acoustic materials are those that can absorb the majority of the sound energy impinged on them. Majority of the fibres used in acoustic applications are natural fibres even though there has been some recent work on the use of natural fibre blends with synthetics.

Atmaca et al. (2005) It has been observed that in industries that the noise levels detected are much above the 80 dB which is more than the specified norms. Because of this majority of the workers in these industries are disturbed from the noise in their workplaces, and found many of them were suffering from hearing problems.

Chen et al. (2007) The study conducted using nonwoven composites with activated carbon fibre (rayon precursor) nonwoven as a surface layer and cotton, ramie, and polypropylene fibre nonwovens as base layers concluded that the activated carbon fibre composites exhibited an exceptional ability to absorb normal incidence sound waves.

Na et al. (2007) Sound absorbent materials produced using micro-fibre fabrics revealed that sound absorption is superior to that of conventional fabric with the same thickness or weight.

Tilak Dias et al. (2007) Sound absorbency of a novel knitted spacer fabric, which can be used in automotive upholstery and has the potential for greater sound absorbency than a conventional plain knitted fabric and its derivatives.

Mahish et al. (2007) found that kenaf and ramie are the main natural fibres used for automotive interiors due to their high tenacity. Other natural fibres such as coir produced from coconut husk, cotton, polyester, flax and hemp are also potential material for acoustic absorption.

Tascan et al. (2008) In the case of woven fabric, the surface area of the fabric is directly related to the denier and cross-sectional shape of the fibers in the fabric was studied for acoustic performance.

Asdrubali et al. (2012) The sound absorption coefficient, SAC is a simple way of defining the sound absorption behaviour of the surface. Nonwoven material is made up of fibre assemblies, so the fibre characteristics have more significant role in absorbing sound

Shahani et al. (2014) Acoustic characteristics of structured needle punched floor coverings in relation to fibre fineness, surface effect, punch density, areal density, and chemical bonding process has been studied. It has been found that higher levels of punch density and higher areal density caused the sound absorption coefficient of the fabrics.

THERMAL PROPERTIES

Morris (1955) considered the thermal resistance of single and multiple layers of fabrics and observed that thermal resistance of multiple layers is larger than sum of individual layers and suggested that it might be due to the enough air covered between the layers of fabrics.

Hoge & Fonseca (1964) studied the thermal conductivity of the Army's M-1950 winter underwear (twelve layers knitted cloth having 50% wool and 50% cotton by weight).

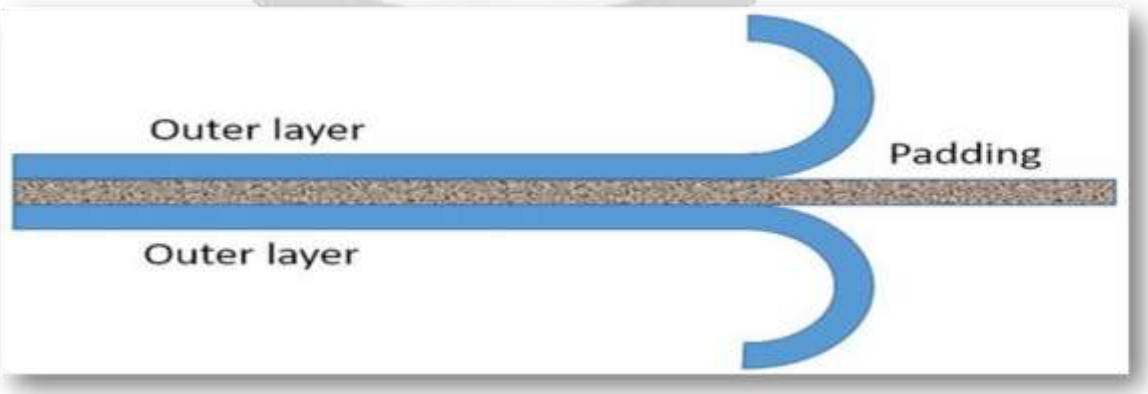
Mohammadi et al. (2003) determined effective thermal conductivity of multilayered nonwoven fabrics and reported that when the weight of the material increases with the decreasing thickness, the structure will be more packed and so the tortuosity increases or the mean free path for the photons decreases leading to higher thermal resistance.

3. MATERIALS AND METHODOLOGY

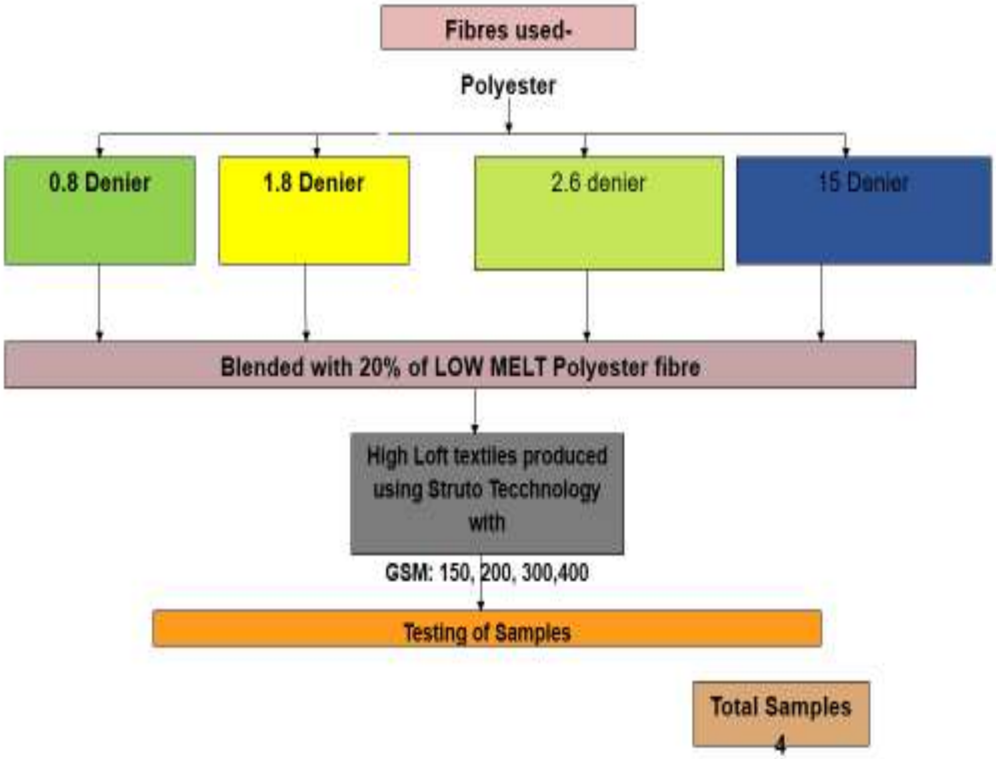
Table 1 Material particulars

S.No	Details
1	Fibre used: Polyester fibre
2	Denier: 0.8, 1.8, 2.6 and 15 denier
3	Low melt polyester: 20% by weight
4	GSM: 150, 200, 300,400

STRUTO" Vertical laid & Thermal Bonding Technique



EXPERIMENTAL METHODOLOGY



TESTING METHOD

S.No.	Test	Instrument	Testing Standard
1	Thickness	Thickness tester	DIN 53855
2	Density	Density tester	CSN 80 0845
3	Resistance to compression and recovery	Compression tester	CSN 64 5441
4	Resistance to compression	Tensile tester LABTEST 2050	DIN 54 305
5	Sound absorption and transmission of materials	Impedance Tube for sound insulation	ASTM E-1050, ASTM E - 2611 , ISO 10534-2
6.	Thermal Conductivity	Thermal conductivity Tester	ASTM C518, ISO 8301, JIS A 1412, DIN EN 12939. DIN EN 13163 and DIN EN 12667

Equipment Used

- Cylindrical carding machine
- Vertical cross lapper
- Vibrating fitter
- Hot air chamber

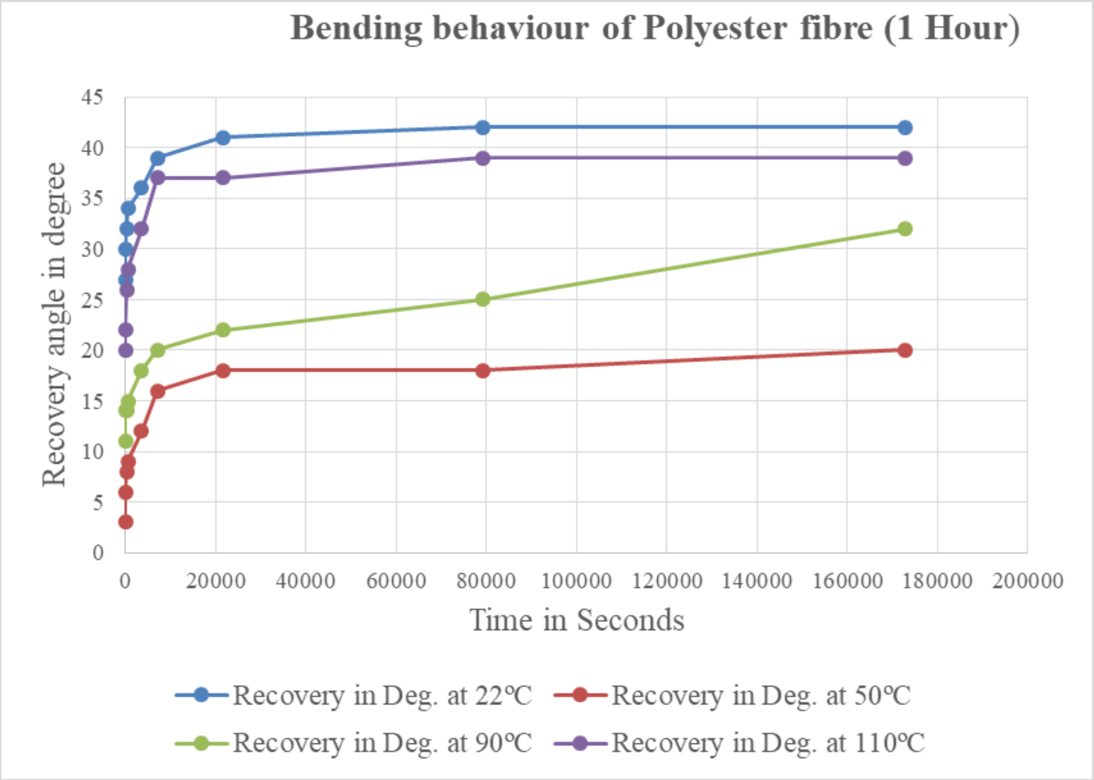
Parameters used for the sample preparations

Sl.No.	Machines	Parameters
1.	Cylindrical carding machine	Inlet speed of 0.2 m / min, Output speed 0.1 m / min
2.	Vibrating fitter	Vibrating frequency- fitter 200 warehouses / min Storage height 20 mm
3.	Hot air chamber	Bonding temperature of 160 ° C
4.	Conveyor speed	32/45/57 m / min. It depends on the weight of the desired fibrous layers.

Results and Discussion

Recovery of Polyester fibre for 1 Hour bending (Polyester Fibre)

Time (s)	Recovery in Deg. at			
	22ºC	50ºC	90ºC	110ºC
0	27	3	11	20
120	30	6	14	22
300	32	8	14	26
600	34	9	15	28
3600	36	12	18	32
7200	39	16	20	37
21600	41	18	22	37
79200	42	18	25	39
172800	42	20	32	39



With reference to Table and Figure which illustrate the bending behaviour of tossa polyester fibre it has been found that the bending behaviour of polyester fibre increases with respect to time and temperature. polyester fibre is more flexible and exhibit more bending recovery.

THICKNESS AND DENSITY OF THE SAMPLES

Average parameters of test samples

Sl.No.	Sample Code	Weight [GSM]	Thickness [mm]	Density [kg.m -3]
1.	0.8 Denier	150	8.50	7.88
2.	0.8 Denier	200	13.5	8.22
3.	0.8 Denier	300	25	11.50
4.	0.8 Denier	400	9.5	9.01
5.	1.8 Denier	150	13.50	10.22
6.	1.8 Denier	200	27.3	12.36
7.	1.8 Denier	300	8.35	6.16
8.	1.8 Denier	400	12.8	7.50
9.	2.6 Denier	150	25.3	8.25
10.	2.6 Denier	200	10.5	8.96
11.	2.6 Denier	300	13.5	11.25
12.	2.6 Denier	400	23	14.36
13.	15 Denier	150	9.2	11.50
14.	15 Denier	200	12.8	13.6
15.	15 Denier	300	21.6	15.7
16.	15 Denier	400	23.12	17.7

TENSILE STRENGTH AND ELONGATION OF POLYESTER BASED HIGHLOFT TEXTILES FOR VARIOUS GSM

Sl.No	Sample Code	Weight [GSM]	Tensile Strength [MPa]	Elongation [mm]
1.	0.8 Denier	150	0.4878	37.51
2.	0.8 Denier	200	0.7889	58.46
3.	0.8 Denier	300	0.9214	70.50
4.	0.8 Denier	400	0.1545	36.33
5.	1.8 Denier	150	0.3075	58.07
6.	1.8 Denier	200	0.5672	60.39
7.	1.8 Denier	300	0.1095	40.21
8.	1.8 Denier	400	0.3215	54.33
9.	2.6 Denier	150	0.5772	70.01

10	2.6 Denier	200	0.3889	41.33
11	2.6 Denier	300	0.62514	58.45
12	2.6 Denier	400	0.79272	70.50
13	15 Denier	150	0.3084	42.23
14	15 Denier	200	0.6791	59.12
15	15 Denier	300	0.76912	70.77
16	15 Denier	400	0.86930	80.62

From the experiment, the tensile properties of high lofts were measured. The results showed increase in tensile property with respect to the GSM.

COMPRESSIBILITY OF POLYESTER BLENDED PERPENDICULAR - LAID NONWOVENS

Sl.No	Sample Code	Weight [GSM]	The maximum compression resistance at 80% deformation [Pa]
1.	0.8 Denier	150	735.47
2.	0.8 Denier	200	834.09
3.	0.8 Denier	300	947.89
4.	0.8 Denier	400	1378.55
5.	1.8 Denier	150	1975.03
6.	1.8 Denier	200	2729.85
7.	1.8 Denier	300	1569.82
8.	1.8 Denier	400	2449.30
9.	2.6 Denier	150	4015.97
10.	2.6 Denier	200	1760.30
11.	2.6 Denier	300	2619.20
12.	2.6 Denier	400	4624.13
13.	15 Denier	150	2352.53
14.	15 Denier	200	3106.10
15.	15 Denier	300	5523.21
16.	15 Denier	400	6420.36

Comparing the results, it was found that the higher the density of the sample, the higher the pressure needs to be expended to compress the sample to the desired deformation. From this comparison shows that density is an important property that affects the compression of highloft textiles. Comparing the deformation curves of fifteen materials, we conclude that, the density of the compressed samples depends on their compression resistance. Higher the density, the greater pressure is required to compress the material to the desired deformation of 80% (i.e. 20% of original thickness).From this work we have found that the highloft textiles produced by using Polyester fibre layer is having better resistance to compression and minimal permanent deformation after dynamic loading.An increase in compression resistance is achieved by the fact that the fibers are oriented substantially perpendicularly to the layer the plane of the fabric. Here the compression process is stressed rather than on the bending, unlike the mostly horizontally arranged fibers. As highloft nonwovens are made from a mixture of base and binder fibers, the compressional rigidity of highlofts depends on both the position of fibers and on their bending modulus. According to our experience, utilization of coarse Polyester fibers will positively contribute in this respect showing high degree of comprerssional rigidity.

ACOUSTICS PROERTIES OF POLYESTER BASED HIGHLOFT TEXTILES

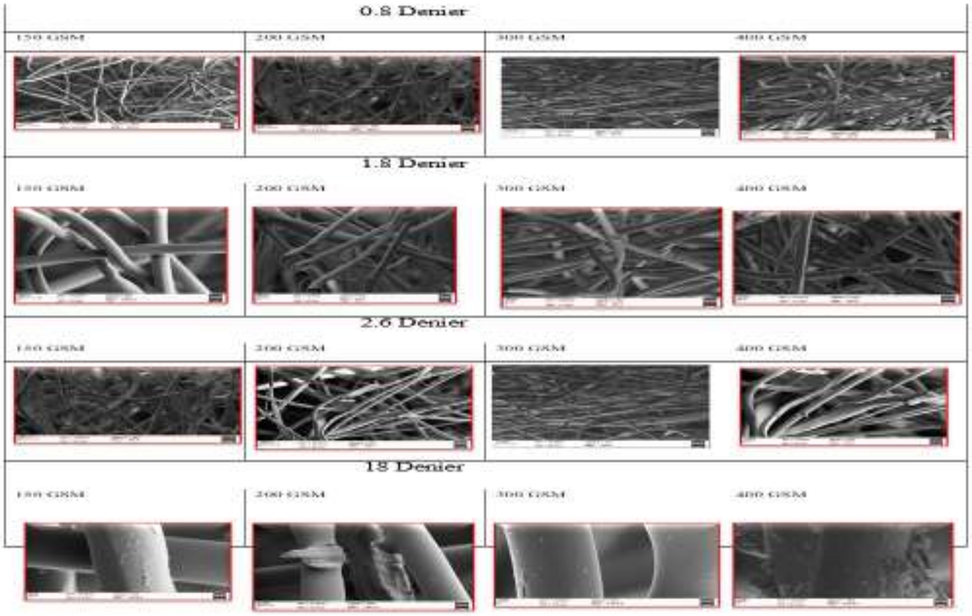
Sound Absorption Coefficient values HIGHLOFT TEXTILES

FRE (HZ)	**SAMPLE NUMBER**															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
250	0.08	0.09	0.07	0.06	0.08	0.07	0.08	0.10	0.07	0.09	0.09	0.09	0.09	0.08	0.10	0.09
500	0.12	0.13	0.09	0.08	0.12	0.10	0.15	0.15	0.09	0.18	0.13	0.14	0.14	0.11	0.22	0.15
1000	0.15	0.18	0.12	0.08	0.15	0.12	0.26	0.22	0.11	0.30	0.18	0.21	0.18	0.14	0.38	0.23
2000	0.43	0.31	0.17	0.11	0.21	0.18	0.47	0.32	0.17	0.44	0.30	0.37	0.27	0.21	0.48	0.39
4000	0.45	0.47	0.33	0.20	0.38	0.33	0.54	0.44	0.33	0.52	0.50	0.63	0.48	0.40	0.60	0.63
6300	0.51	0.52	0.45	0.30	0.49	0.43	0.57	0.50	0.43	0.58	0.55	0.68	0.57	0.51	0.68	0.64

It is found that there is direct relationship between weight per square meter and sound absorption. The increase in GSM levels will definitely contribute in achieving maximum SAC values at even lower, medium and higher frequencies. The outcome of this study proved that perpendicular laid nonwovens produced using polyester fibre possessed better acoustic absorption behaviour, especially at higher frequencies, which might be very beneficial for health care applications. It can be concluded that the SAC values drastically improved with the increase in GSM. Installation of noise absorbent barriers produced from polyester based highloft nonwoven materials with polyester fibre will definitely give permanent solution for acoustic problems faced globally.

EFFECT OF VOID ON ACOUSTIC PROPERTIES USING

FIELD EMISSION SCANNING ELECTRON MICROSCOPY (FESEM)



The FESEM images of the highloft materials produced are shown in the Figure

THERMAL PROERTIES OF POLYESTER BASED HIGHLOFT Textiles

Thermal Conductivity and Thermal Resistance values

Sl.No.	Sample Code	GSM	Mean Temp. (Deg. C)	Delta Temp. (Deg. C)	Thermal Conductivity W/m-k	Thermal Resistance M2 *k/w	Temperature gradient deg K/m
1	0.8 Denier	150	39.17	9.31	0.038495	0.222415	1087.15
2	0.8 Denier	200	39.15	9.21	0.03838	0.188072	1231.12
3	0.8 Denier	300	39.16	9.25	0.040601	0.199543	1141.14
4	0.8 Denier	400	39.07	9.2	0.047935	0.190984	1269.38
5	1.8 Denier	150	39.19	9.47	0.048814	0.29731	744.15
6	1.8 Denier	200	40.07	9.96	0.059098	0.424356	625.39
7	1.8 Denier	300	40.01	9.97	0.053427	0.455218	646
8	1.8 Denier	400	39.02	9.67	0.051003	0.465781	406.89
9	2.6 Denier	150	40	9.93	0.052653	0.477967	732.27
10	2.6 Denier	200	40.27	9.91	0.057705	0.48416	447.59
11	2.6 Denier	300	40.2	9.95	0.074052	0.674197	476.29
12	2.6 Denier	400	40.07	9.97	0.070329	0.602053	492.96
13	15 Denier	150	40.19	9.95	0.070676	0.672999	415.06
14	15 Denier	200	40.19	9.94	0.072269	0.687191	390.43
15	15 Denier	300	39.99	9.99	0.078279	0.69146	421.07
16	15 Denier	400	40.12	10.13	0.083162	0.71156	435.12

The thermal conductivity and thermal resistance properties of polyester based, highloft textiles depend on the nature and fineness of the fibres, inter-fibre pore size, fibre orientation, the distribution of fibres in the nonwoven, and the overall bulk density of the materials. Based on our observations the fiber content, length of individual fibers, orientation, extent of intermingling of fibers, bonding of fibres plays a greater role in achieving the required thermal insulation. Here we could notice the influence of polyester and low melt bi component fibre % on thermal resistance value of highloft textile at different GSM levels. The combination of polyester and low melt bi component fibre showed better thermal resistance value of nonwovens

CONCLUSION:

- Good elastic recovery as a function of time confirms that polyester fibre can be used for making bulky materials.
- For the Production of polyester based highloft textiles it is clearly found that the Struto system (vertically lapped) is best suitable technology.
- The tensile properties of highloft textiles showed increase in tensile strength with increase in GSM.
- Polyester Highloft textiles samples got higher compression resistance with increase in GSM

- Sound absorption of polyester based highloft textiles has a direct relationship with weight per square meter. The increase in GSM levels contribute in achieving maximum SAC values at even lower, medium and higher frequencies.
- From FESEM image obtained we can clearly observe that the polyester based highloft textiles material produced with low melt bi-component fibres gets adhered to the polyester fibre component.
- By increasing GSM of sample the results showed increase in the thermal insulation of polyester based highloft textiles material.
- It can be concluded from this study that polyester-based highloft textiles can be used effectively in different thermal insulating application. There are vast scope as insulation material from polyester-based material for different household, manufacturing, and attire applications

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