



APPLICATIONS OF SPACERS MADE WITH DOUBLE BAR RASCHEL MACHINE

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Abstract: Nowadays, textile technologies develop to adapt their different techniques for creating new products for the different sectors of application every day.

Particularly, warp knitted fabrics and warp-knitting technology have applications in all different groups of technical textiles. It could be the most applied technique, the most versatile technology to develop new textile products for the new textile market. Warp knitted fabrics play the most important role among the technical textile fabrics.

This technology is used in different product groups such as mobile textiles (car seat covers, dashboard cover), industrial textiles (composites), medical textiles (anti-decubitus blankets), sports textiles and foundation garments (bra cups, pads for swimwear). This study presents some examples of the application of this technology in some markets

Within the market of technical textile, medical textile has an increasing relevance and knitted fabrics and knitting technology, at the same time, play a very important role in the fields of technical and medical textiles. Studies have demonstrated that knitted structures possess excellent mechanical properties and can promote more effective regenerative medicine, tissue repair, ligament, tendon cartilage, reconstruction, etc.

The aim of this paper is to present different possibilities of textiles developed with this kind of structures, to present different alternatives, different examples of products obtained with this kind of textile structure combined with the correct kind of textile fiber. In this kind of technology, double-bar raschel machines used for producing three-dimensional textiles, spacers, play an important role.

Key words: Spacer, Knitted, raschel, warp. Textile.

1. INTRODUCTION

Importance of technical textiles is great and increasing. Experts estimate annual rising ratio of this application of textile materials is 3.8 % on average and consumption in each field of this group of applications is anticipated as growing. Roughly, one third of the quantity of the world's fibre consumption is used in production of technical textiles [1].

Warp knits have been playing a predominant role in the area of technical textiles, as recent researches point out. Concretely spacer fabrics is an important option to develop new applications. [2]

Spacer fabric is a three-dimensional knitted fabric consisting of two separate knitted substrates which are joined together or kept apart by spacer yarns.



There are two types of spacer fabrics: warp-knitted spacer fabric and weft-knitted spacer fabric. The first type is knitted on a rib raschel machine having two needle bars while the second is knitted on a double jersey circular machine having a rotatable needle cylinder and needle dial

The aim of this paper is to present the possibilities of warp-knitted spacer. A spacer fabric is a double-faced fabric knitted on a double needle bar machine. The distance between two surfaces is retained after compression by the resilience of the pile yarn (usually mono-filament) that passes between them [3].

Double-bar raschel machines are designed for producing spacer textiles. Depending on the type of machine, to form a spacer structure, fully threaded guide bars are used to form each of the side fabrics while an additional fully threaded guide bar joins the two fabric sides by joining threads. The spacer fabric may be up to 60 mm in thickness.

Textiles produced by these machines are mainly used in the shoe and mattress sectors, but also in other sectors such as the automotive industry. Spacer textiles are also becoming increasingly popular for seats and chairs, because they allow air to circulate.

Actually spacer fabrics are widely used in different products such as mobile textiles (car seat covers, dashboard covers), industrial textiles (composites), medical textiles (anti-decubitus blankets), sports textiles and foundation garments (bra cups, pads for swimwear).

Spacer fabric as a component material is highly breathable, thus creating a moisture free environment, which in turn reduces the chances of skin maceration. These lead to an increased level of comfort when compared to materials such as foam, neoprene and laminate fabrics. Spacer fabrics are regarded as environmentally friendly textile materials (unlike polyurethane foam), since they can be recycled [4]

2. TECHNOLOGY

We can separate these technologies into different kinds of machine due to their working width, their distance between needle beds, gauges, etc. The original technology starts with the machine to produce blankets. Nowadays this technology has developed other important kinds of machine, other important kinds of this type of warp knitted technology. As examples of this kind of machines, to develop specific products we can use the following:

2.1. Double needle bed warp knitting machine (30-50 inches).

This machine works widths between 30-50 inches, distances between needle beds between 1 - 20 mm, for the production of a wide range of articles. This machine allows for making: Technical uses (netting for sports equipment and the food industry, high resistance ribbons in special fibres, ribbons and fabrics for applications in the geo-textile, automotive, building and industrial sectors), medical uses (tubular elastic netting, emergency bandages and dressings, disposable underwear), footwear (spacer fabrics for uppers), women's apparel (mesh stockings and pantyhose) and fashion fabrics [5].

2.2. High Distance.

Special machines for producing technical and semi-technical 3D textiles. With adjustable spacer widths of 20-35 mm, and with adjustable spacer widths of 20-65 mm. Applications in mattresses and bedding, Automotive seats, Upholstery fabrics and velour

2.3. Seamless

Double-bar raschel machines for producing seamless fabrics for the apparel and sports sectors. With piezo jacquard technology designed to produce plain and patterned tubular goods and seamless products.

3. SPACER PRODUCTS

Space fabrics are widely used in different products, for different markets. Examples about these products in the different markets are listed below.

Partly-threaded guide bars can produce open-hole structures on each surface and air circulation can occur in the different millimeter spaces between the two surfaces. An important advantage is the low weight in proportion to the large volume.

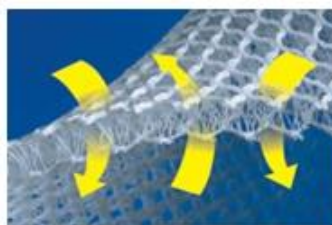


Fig. 1: Possibility air circulation

Spacer fabrics are used for environmental reasons, which can be used in different product groups such as mobile textiles (car seat covers, dashboard covers), industrial textiles (composites), medical textiles (anti-decubitus blankets), sports textiles and foundation garments (bra cups, pads for swimwear). This study presents some examples of the application of this technology in some markets

3.1. Mobile textiles:

Car seat covers, dashboard covers, filling seat in substitution of polyurethane foam.

These meshes, thanks to their great ductility, allow for making bodies of quite different geometry and density. It grants a good distribution of pressure. This physical and technical quality make them suitable to meet a wide range of applications.

This kind of 3D could be spacer widths of 20-65 mm. The spacer fabric incorporated herein offers an excellent seating comfort thanks to its perfect climatic behaviour.



Fig. 2: HDR 6EL High distance Karl Mayer [6]

3.2. Industrial Textiles:

Packaging, protective and safety nets. Nets for a wide variety of sectors – from the aerospace, medical and sports sectors to safety applications – as well as agricultural nets.

Textiles in filtration, for the separation of solids from liquids or gases by textiles made with spacer warp knitted, save energy, improve processefficiency, recover precious materials and general improvepollution control [7].



Fig. 3: Net made with double bar raschel machine

3.3. Sport textiles:

Sports and leisure shoes.

Warp-knitted spacer fabrics are continuing to make headway - breathable, tough and stylish, they are increasingly taking over from flat fabrics in the shoe fabric sector.

Elastic spacer fabric are used as underwear for diver's suits.

Spacer fabrics patterned with jacquard designs are products showing real growth potential. Shoe manufacturers in particular are becoming increasingly interested in spacer fabrics with their wide range of different designs. They are creating a demand that has led to textile producers investing continuously in new, innovative production machinery -



Fig. 4: Spacer fabrics patterned with jacquard designs [8]

3.4. Functional clothes

Knitted fabrics may be important components of functional clothes, too. For example, spacer fabrics can be used here as lining that, due to its hollow structure, enables ventilation inside the garment or, due to its elastic behaviour in thickness direction, protects against pressure or hit. This is why this fabric is a penchant for lining of motorcyclists' protective garments [9].

Innovative, warp-knitted seamless components can be produced in a single sequence, without any seams, for the toes, fingers and even the head. They can be used in functional sportswear, underwear, hosiery and fashionable outerwear.

This kind of technology produces seamless hosiery, fashion garments, lingerie, sportswear, medical garments and shape wear.



Fig. 5: New line of unique lingerie, bodyshapers, posture garments and sportswear products based on seamless warp knitting technology - [9]

3.5. Medical textiles

Medical textiles are a highly specialised stream of technical textiles industry with a growing range of applications. A significant advancement has been achieved in surgical products or biomedical textiles (implantable/non-implantable) with the advent of 3D textile manufacturing techniques. Cardiovascular soft tissue implants (vascular grafts) have been a field of interest over decades for use of innovative 3D tubular structures in treatment of cardiovascular diseases. In the field of soft tissue implants, knitted and woven tubular structures are being used for large diameter blood vessel replacements. Advent of electrospinning and tissue engineering techniques has been able to provide promising answers to small diameter vascular grafts. [10]

Many kinds of textiles are used in medical treatment. It is not surprising that a great part of clothing worn by doctors and nurses in hospitals and clinics is product of the knitting industry (e.g. undershirts, socks). But sometimes they are not conventional ones, they are made from yarns or with finishing that make them antibacterial against infections or against the rising of unpleasant sweaty smell. Various types of bandages (both rigid and elastic), surgical stockings, certain parts of orthopaedic equipment (orthoses) (like knee-, wrist- and elbow-braces, calf and lumbar supports, etc.) are also made by knitting technology. An important application field for spacer fabrics is the manufacturing of mattresses for beds, operating tables and wheelchairs.

Cooperation of doctors and technical experts of the textile industry can lead to development of new surgical technologies. Structure of the textiles used as implants is determined by its material composition, fibres' behaviour and features of degradation. Materials of sutures and implants having biologically good properties, designable absorption and degradability and that endure the sterilization process are continuously subjects of research. At the same time, continuous development of textile technologies and machines enables to develop newer and newer methods in surgery and medical treatment. For this mutual development textile technologists and doctors must closely cooperate, while all the administrative procedures concerning manufacturing and trading of such products must be strictly respected. [1]

Branched artificial blood arteries are produced on a fine gauge Raschel machine with 16 guide bars.



Fig. 6: Medical Textiles: Artificial blood vessel, [11]



4. CONCLUSIONS

For decades, knitted technology, concretely double bar raschel machine, has been applied to manufacture home textile like blankets and velvet.

Nowadays, considerable developments have taken place for the knitting technologie. Concretely in double bar raschel machine different developments allow making innovative applications in different markets.

Spacer fabrics due to their mechanical characteristics could be used to produce diferent products

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This kind of textile products have characteristics, such as air permeability, thermal conductivity and low-stress mechanical properties, stretchability, recovery, bending and compression.

These characteristics depend very much on the spacer yarn type and the spacer yarn arrangement. Bending properties are closely related to the fabric type, structure, spacer yarn type and density while stretch and recovery properties depend very much on fabric type and spacer yarn type.

Spcer fabric is a good need to develop textile products.

Thus, knits clearly prove their versatility in the various field of technical applications and therefore hold the promis to even more areas of applications in the furure

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