

Use of warp-knitted spacer textiles in mattresses

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An optimum support for the body, specific areas which bend flexibly and excellent performance in terms of their moisture-wicking and temperature-controlling characteristics, all these characteristics for use in mattresses have been perfected by painstaking development carried out by manufacturers throughout the entire manufacturing chain. They have then been carefully tested in the laboratories of various institutes and research associations. Spacer fabrics awarded the material top marks when measuring the contact pressure on mattresses [1] and also examined the compression load deformation characteristics and indentation hardness [2]. But it seems that mattress manufacturers and the trade never really received the 'glad tidings'. The 2006 Furniture Fair in Cologne, which was held from 16-22 January of this year, could perhaps provide the answer.

We spend roughly a third of our lives in bed, which is why we should place a high value on the construction and components of this particular item of furniture, in which the mattress plays the most important role. It must suit the specific comfort needs of the person lying on it, match the shape of their body and sleeping habits, avoid posture problems, promote rest and relaxation during the night, and help to create a feeling of well-being during the day.

This is a job for good, all-round bedding materials, i.e. warp-knitted spacer textiles. With their range of different hardness zones in particular, they provide optimum support for the body; they can also bend flexibly in specific areas so that the 'in-bed reader' feels comfortable, and offer excellent performance in terms of their moisture-wicking and temperature-controlling characteristics.

Roughly 70 exhibitors were presenting the latest developments in the fields of mattresses, lying/reclining systems and bed products in hall 9 of the Cologne Furniture Fair. As always, the most popular cushioning materials for the bed were sprung mattresses, followed by foam, latex and visco memory foam. Sophisticated constructions, such as pocketed mattresses and imaginative relief surfaces worked onto structured foam mats having varying degrees of porosity, all provide the comfort needed for restful sleep. Many manufacturers are unaware that these features can also be provided by a simple 3D material with cover faces and a pile layer, which has been designed to meet specific applications, or perhaps they are still a little wary of it. Moving

away from something old and dependable towards a high-tech material is always a slow process.

Breathable strips in the mattress ticking

The first step taken by mattress manufacturers towards using 'spacer textiles' was to use them in relatively thin thicknesses of 3-5 mm as lateral strips running around the mattress cover to improve its breathability. Examples of this could be seen on the stands occupied by Fey & Co. GmbH & Co. KG, Emsdetten/Germany, Rummel-Matratzen GmbH, Neustadt an der Aisch/Germany, in the Sensoflex sleep system, Van Landschoot N.V. Matrassenfabriek, Maldegem/Belgium and Koninklijke Auping B.V., Deventer/Netherlands.

Spacer textiles as a component in the mattress construction

The mattress manufacturer Auping has gone one step further with integrating spacer textiles into the bed. This company has made it a functional component of a breathable ventilation zone, which is

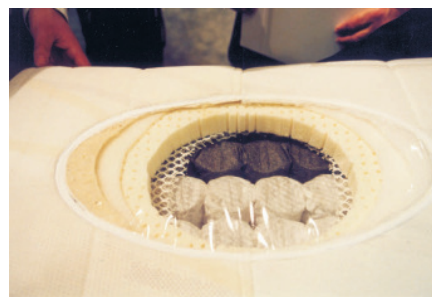


Fig. 1 Warp-knitted spacer textile as a component of the ventilation zone in Auping's mattress core

located under an assembly consisting of an absorbent mattress cover and a layer with an open structure for wicking away moisture. This clever back ventilation system is made up of two elements, an open-pored, warp-knitted spacer textile having a thickness of about 40 mm, and the open, spiral network of the sub-spring assembly (Fig. 1).

Every movement produces a pumping effect, which permits the air to circulate freely and moisture to be wicked away. 'The mattress actually breathes with you,' promises the company in its description of its new AVS (Active Ventilation System) mattresses, which are also available in two versions.

Depending on the season of the year and the climatic requirements of the sleeper, the user can choose between a cooling or a warming version. This difference in climatic comfort is achieved by a 40-mm-thick, open-pored spacer textile under the mattress drill. With its airy construction, this 3D material creates a pleasant feeling of coolness, prevents heat from building up, and reduces perspiration.

The concept of a surface layer having a spacer sub-lining also impressed the company, Freyja Schlafsysteme, Weischlitz/Germany. In keeping with its modular mattress system, in which the comfort can be altered in the vertical direction, the spacer textile can also be used and removed as a modular system. As an added comfort feature for people who perspire heavily, it can be inserted easily into a zippered pocket of the cushioned mattress cover.

This 'air-conditioning system for beds,' as the managing director, *Wolfgang Frey*, describes the spacer material, is approx. 25 mm thick, has an open-pored surface, and is perfect for ventilating the backs of sleepers in hot countries. The spacer textile also ensures that the body does not sink too deeply into the mattress during sleep. As *Wolfgang Frey* explains, 'Because it is possible to improve the properties of the mattress, this innovative material has become an important element in our marketing strategy.' Another advantage of the removable, warp-knitted spacer textile is that it can be machine-washed with no problems.



Fig. 2 Mattress topper from Sanders, featuring a spacer textile in the inner quilting of the shell

Other manufacturers placing their trust in this functional, 'undercover' textile include Matra AG Swissflex, Flüh, Basel/Switzerland, whose mattresses feature a 20-mm-thick HighDistance mat firmly attached to the surface, and Gebr. Sanders GmbH & Co. KG, Bramsche/Germany, which not only uses spacer textiles in its ClimaBalance mattress covers, but also in its 40-mm-thick mattress toppers. These consist of a foam core and a shell, onto which a pile fabric with a thin spacer textile produced on an RD 6 N machine in a gauge E 22, is quilted on the inside (Fig. 2). Whether used as a cover or on its own, this is the perfect surface for sleeping on - and it can also be used when travelling.

Spacer textiles as climate zones and in waterbed

Sanders also uses the advantages of warp-knitted fabrics as a comfort feature in its down-filled duvets. In this application, they form square, quilted, breathable climate zones (Fig. 3) and create balanced conditions of moisture and warmth underneath the cover. According to the manufacturer, up to three times more moisture is given off from this innovative combination of conventional down and high-tech textile compared to conventional down-filled duvets.

At the 2006 Furniture Fair, The Sleeping Society n.V., Boom/Belgium, was showing how spacer textiles can be combined both with foam and sprung interiors, as well as with water. This company uses three layers of spacer material, each having a thickness of 40 mm, between several nonwoven layers. This cushioning package, which is known as Airlay, is integrated into the Bodytone Supreme waterbed mattress (Fig. 4). The nonwoven layers have different constructions, their position can be varied, and they are thus available in four different versions for supporting the back. The integrated spacer textile does not become crumpled, even during transport. It also prevents the so-called 'hammock ef-

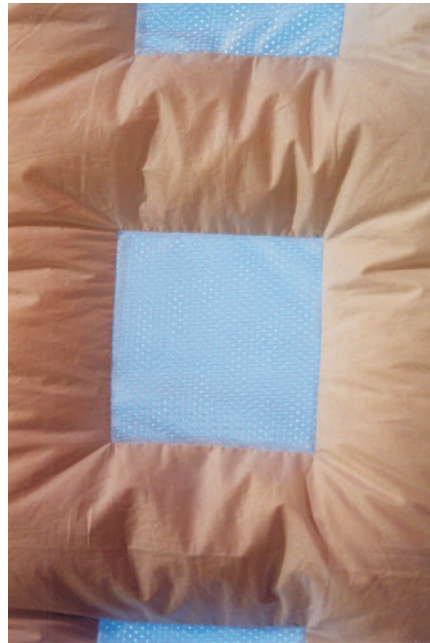


Fig. 3 Breathable climate zones, consisting of a warp-knitted mesh, in Sanders' down-filled duvets

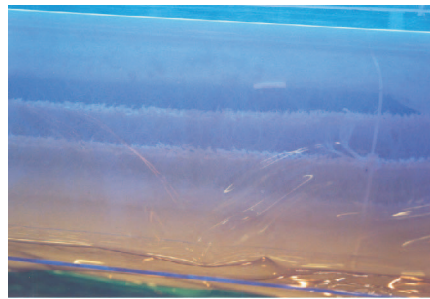


Fig. 4 Nonwoven/spacer textile assembly - the cushioning package that 'calms the water' in the waterbed, from The Sleeping Society

fect' so dreaded by heavier sleepers, and efficiently helps to reduce the movement of the water. Conventional waterbeds need a complicated system of chambers or a waffle cylinder construction to create the same sort of effect.

The Sleeping Society also sets great store by warp-knitted spacer textiles for mattress covers, and recommends them for use in babies' cots in particular.

Full-size spacer mattress

Phi-ton, AL, Arnhem/Netherlands, is currently the only manufacturer to appreciate the advantages of the properties of breathable spacer textiles for providing comfort during sleep, and to use them in the right way. This company puts its trust in spacer textiles exclusively, from core to cover (Fig. 5), and is now using this innovative material in its pillows. These are available in a conventional form or as a

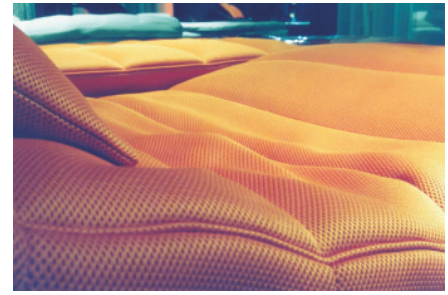


Fig. 5 Phi-ton sleep system made entirely from warp-knitted spacer textiles

support version. The logical materials concept offers a 40-mm-thick HighDistance spacer textile with a relatively open-pored surface and a specific pile layer construction is used in the mattress. When arranged in a three-layer stack, this provides exceptional pressure-relieving characteristics, under both static and dynamic loading, as well as exceptional air- and moisture-permeability and optimum hygiene properties. What's good for the mattress is good for the cover! In this case, a 3-mm-thick fabric, produced on an RD 6 N machine in a gauge of E 22, is used here. When dyed in warm orange or cool white, this is soft, cuddlesome, breathable, washable and permanently dimensionally stable, and can withstand high spot-loading. Elbows propped up on it for reading do not sink into it, and no imprints are left behind.

The Phi-ton Spacer System provides the ultimate in sleeping comfort - and was awarded the Interior Innovation Award at the imm 2006 Cologne Furniture Fair on the opening day of the exhibition in the Materials-Innovation category. This prize is awarded for product innovation, based on the use of a material that has never been used before in the relevant product category. The use of existing materials within a new context is also judged. The item should combine innovative design and functional solutions, and should demonstrate a pioneering spirit and the courage to try something new.

References

- [1] Kettenwirkpraxis 1 (2005), 21-22
- [2] Kettenwirkpraxis 4 (2005), 8-11

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