

COTTON BLENDS WITH TENCEL® AND LENZING MODAL®

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ABSTRACT

Lenzing as the world leader in Man Made Cellulosic Fibers presents Lenzing Modal® and TENCEL® as ideal fibers for cotton blends as derived from renewable and natural sources wood. Both fibers are produced via environmental friendly production processes.

It could be demonstrated that these fibers are ideal partners for blending with cotton improving yarn quality – specifically thin places – leading to fabrics with soft appearance, luster, moisture management and wear comfort.

FIBER MARKET IN 2020

Looking back in the development of the fibers market in the last 50 years there has been a strong dominance by synthetic fibers. This success story of synthetics from a market share from close to 0% in 1960 up to almost 70% in 2010 was due to the excellent property to cost relation. Cellulosic fibers including cotton have been losing ground during that period.

The consumption of fibers has been driven by the industrialized countries and on a consumer level is highest in US reaching more than 40 kg/capita, compared to around 10,7 kg/capita worldwide. Due to the increasing demand in the developing countries a world average of 13,2 kg/capita (10,7 in 2010) in 2020 is predicted, leading to a global consumption of 102,4 mio tons (73,8 mio tons in 2010), that is an average yearly growth of 3,3% (Fig 1) for all fibers where 2,2% by the per capita increase is more important than population growth with 1,1%. Due to stagnation of Cotton crop at around 28 mio tons a Cellulose gap might appear (red zone in the graph).

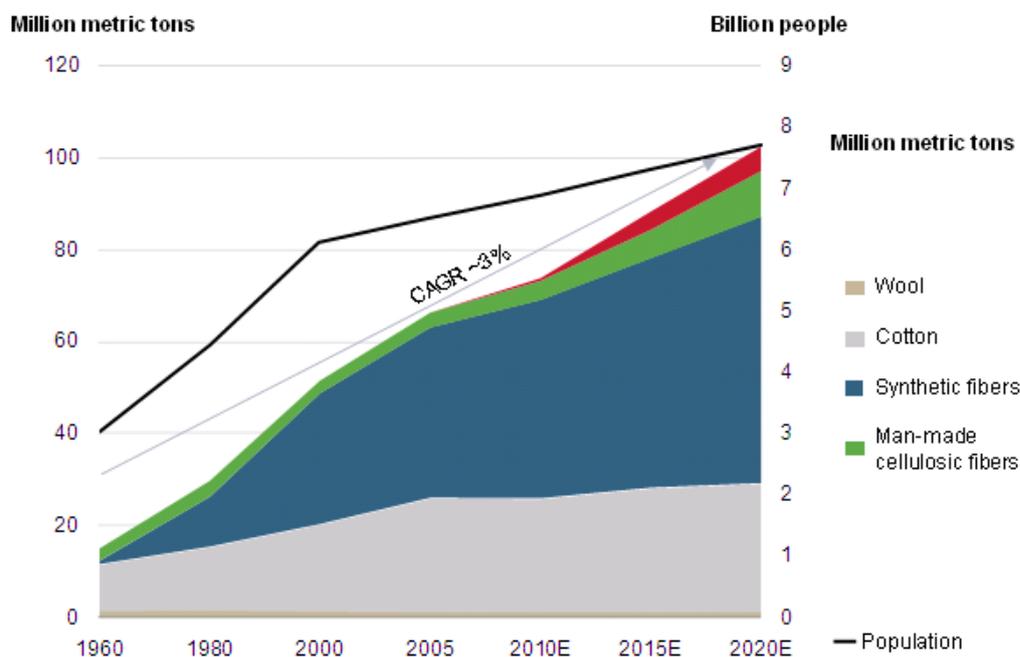


Fig. 1: Market development of Fibers until 2020

MAN MADE CELLULOSICS TAILOR MADE FOR COTTON BLENDS

Cotton and Man Made Cellulosic Fibers are both based on the same polymer – cellulose – which is providing moisture uptake as essential factor for comfort. Experts believe that the cotton production is limited by 28 million tons in 2020 due to reduction of arable land and limitations in water availability as cotton is grown in warm climate – irrigation of freshwater is often prerequisite. Due to these limitations of growth for cotton, cellulosic fibers are perfect alternatives to filling that gap, specifically with TENCEL® and Lenzing Modal® which are perfect blending partners.

Cotton and MMC fibers best suited as clothing textiles due to superior moisture management (Fig 2) and can be tailor-made in respect to thickness (denier) and staple length in order to be optimized for applications and as blending partner (Fig. 3):

Moisture Regain of Textile Fibers

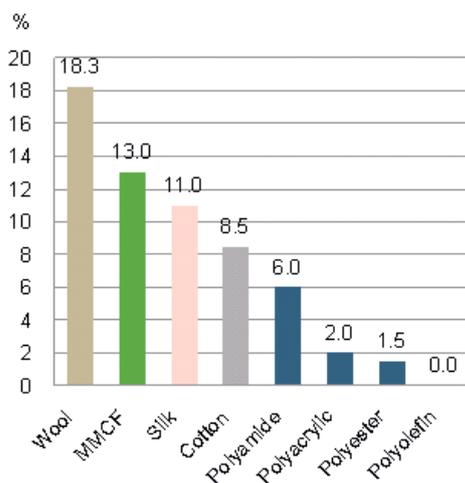


Fig. 2: Moisture Regain of Fibers

Fiber Thickness

Fiber	Thickness of Fiber
Cotton	1.3- 3 dtex
Viscose	1.3- 8.0dtex
Lenzing Modal®	0.8- 7.0 dtex
TENCEL®	0.9 - 20 dtex

Fig. 3: Fiber Thickness of Man Made Cellulose Fibers can match Cotton

Lenzing Fibers are matching the requirements of a sustainable produced fiber which has been confirmed by a number of certificates and institutes:

- Lenzing commissioned the Copernicus Institute of Utrecht University, Netherlands, to conduct a first-time comparative life cycle analysis for Lenzing Viscose® (Austria, Asia), Lenzing Modal® and TENCEL® (Austria) in direct comparison to cotton (USA and China), polyester fibers (Western Europe) and polypropylene fibers (Western Europe), which showed comparatively a very little environmental impact.
- Lenzing is listed at the VÖNIX (Austrian Sustainability Index),
- amongst the CSR ranking Austria 2008,
- has been the pioneer in the European Eco-Label (European Flower),
- fulfils the criteria of Responsible Care

- TENCEL® fibers received the Panda Award by WWF Austria in 2003
- In 2000 the European Award for the environment
- ISPO has given the ECO Responsibility Award for TENCEL® SUN (2011)
- TENCEL® has recently been also certified to be labeled as bioBased fiber according to USDA.
- Further labels like Ökotex 100,
- Nordic Swan,
- PEFC (Chain of Custody) and
- FSC (Chain of Custody)

are standard in Lenzings certification system.

TENCEL® - ENHANCES COTTON

TENCEL® has been in the breakthrough technology (Fig. 4) in MMF in the last 20 years, receiving several awards for its environmental friendly process as mentioned above.

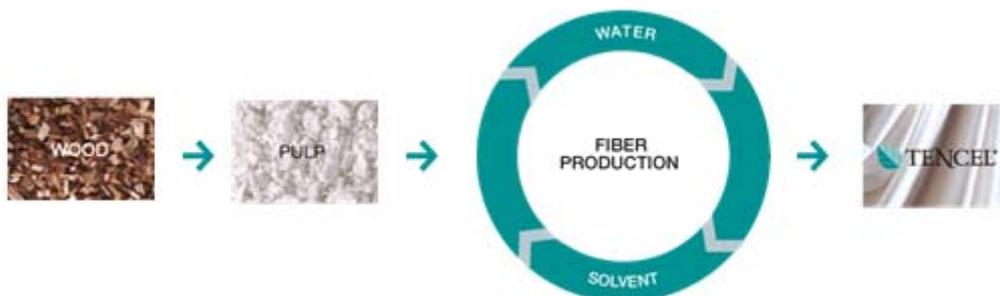


Fig 4: TENCEL® technology

Uniformity of the fibers is one of the advantages of Man Made Cellulosic's in general and TENCEL® as well as Lenzing Modal® are consequently perfect blending partners improving the quality of the yarns in respect to e.g. thick places as shown in Fig. 5.

Thick Places - 100 % Cotton vs Tencel/Cotton

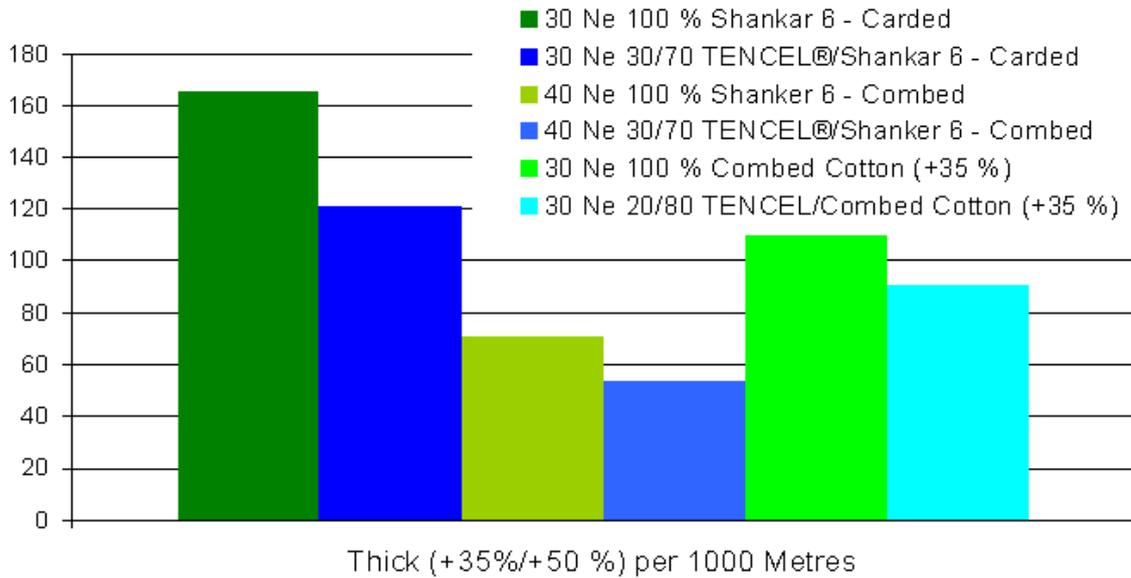


Fig. 5: Thickplaces of Indian Shankar 6 versus blends with cotton of different yarn counts

This is also confirmed by a fine yarn (Ne 60/1) comparison between a blend of 33% MicroTENCEL® with 65% Turkish DRESS cotton and an Israel PIMA cotton yarn (Fig.6). Improved yarn quality (slightly lower tenacity but higher elongation) even versus an Extra Long Staple cotton can be achieved which might open doors for an economical attractive version – blending a cheaper cotton with TENCEL® getting similar yarn properties as with 100% ELS.

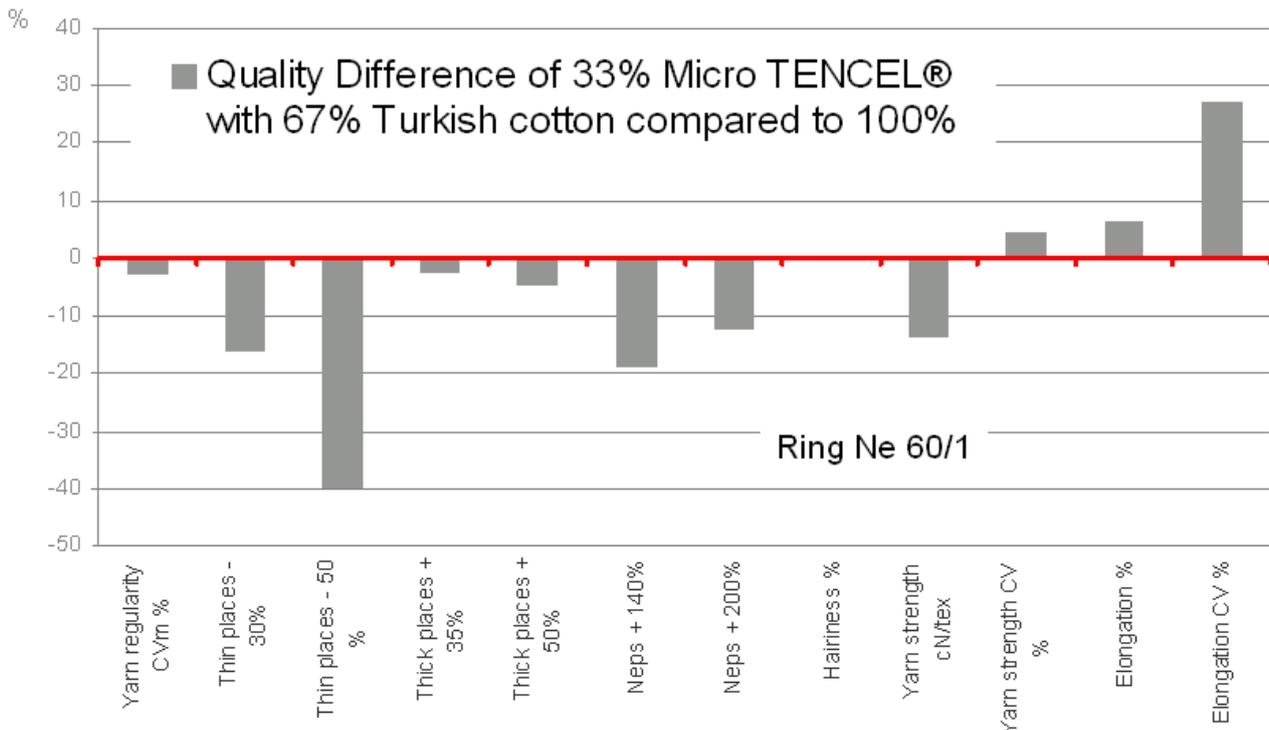


Fig. 6: Yarn property differences of a blend of MicroTENCEL® with cotton compared to Israel PIMA (Ring Ne60/1)

But of course also a blend with extra long staple cotton works very well resulting in the improvement of yarn quality of finest yarns (Ne 80/1) in respect of thin- and thick places as well neps (Fig. 7)

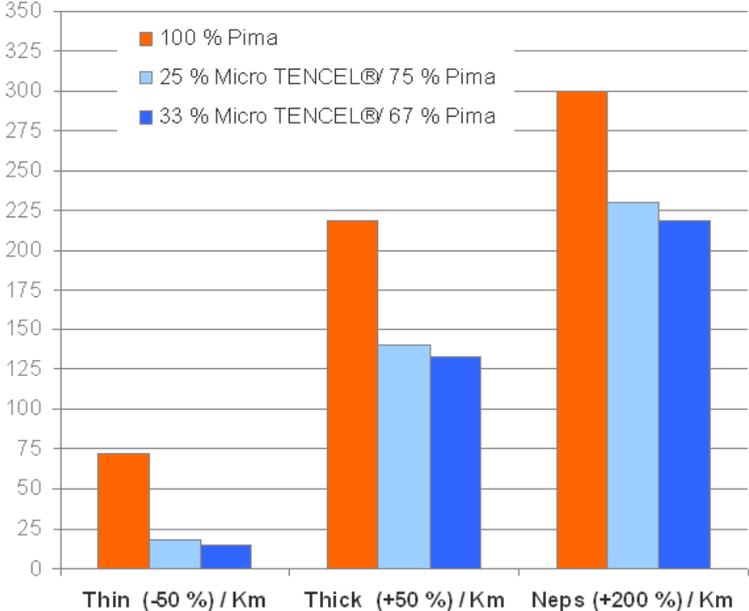


Fig. 7: Finest yarn (Ne 80/1) MicroTENCEL® blends with Pima and 100%

Also MicroModal® demonstrates its ability to improve yarn quality. Fig. 8 shows that e.g. thin places are improved when yarn counts are finer – this is of paramount importance in the weaving process.

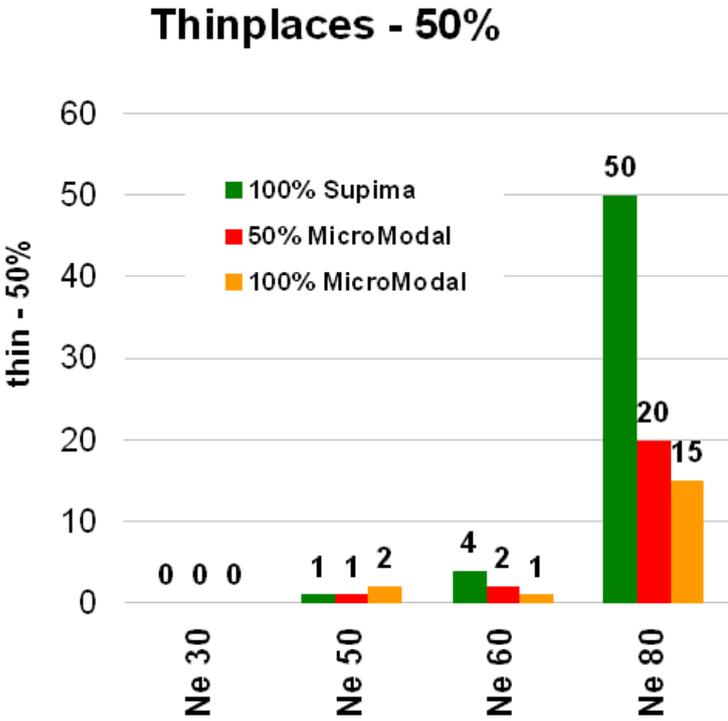


Fig. 8: Ringspun yarns of Supima with MicroModal® and blends

These examples demonstrate the potential of high quality cellulosic fibers from Lenzing specifically TENCEL[®] and MicroModal[®] creating improved yarn qualities.

Cotton to be spun by Air Jet spinning technology with blends in MicroModal[®]

Another option appeared recently as the Airjet spinning technology is a breakthrough in spinning - up to 450 m/min spinning speed are achievable with Lenzing Modal[®] and MicroModal[®]. Tests with blends of cotton with MicroModal[®] demonstrated that it is possible to open doors for cotton for this innovative technology. Cotton might be then more widely used as so far it is limited only by special cotton types to be efficiently processed by this new technology.

Lenzing Modal[®] - BOTANIC SOFTNESS by Edelweiss[®] Technology

The fiber plant in Lenzing Austria is the only one in the world which is fully integrated and has all production steps, from the pulp to the fiber. Throughout the entire process, attention is paid to environmental protection.

Lenzing is a pioneer in the field of wood-organic refineries. The integrated, CO₂-neutral process at the Lenzing site in combination with other innovative processes results in excess energy generation and the production of high quality chemicals like food grade acetic acid and Xylit for artificial sweeteners from the wood. The Lenzing pulp factory serves as a net supplier of power for the entire Lenzing site.

Beech wood proliferates by rejuvenation so no reforestation or plantations are necessary. More than half of the wood used at Lenzing comes from Austria and the remainder from neighbouring countries.

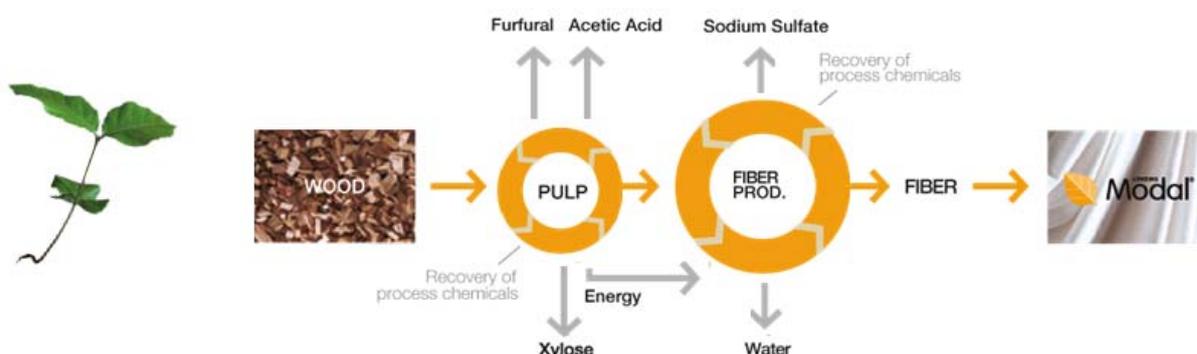


Fig 9: Lenzing Modal[®] Edelweiss[®] technology

Lenzing Modal[®] is setting a new ecological standard for Modal fibers as it is based on the unique Edelweiss technology developed by Lenzing:

- Beech wood as raw material
- Excellent carbon footprint as only 13 % fossil fuel as energy source
- Recovery systems work at levels > 95%
- Oxygen bleaching technology of pulp and fiber

However, it is not only the fiber's eco-friendliness which makes it so compelling. The fiber's performance properties such as color brilliance, absorbency, and softness make goods of Lenzing Modal® particularly appealing to consumers. In fact, 89% of consumers in a recent survey stated that e.g. towels with Lenzing Modal® stay softer than 100% cotton towels even after repeated washing. Plus, colors are richer and more intense with Lenzing Modal®.

Gradual fading or graying is no longer an issue with Lenzing Modal® terry goods. And finally, Lenzing Modal® towels deliver a higher absorption rate than 100% cotton towels thanks to the fiber's unique structure.

Lenzing Modal® and MicroModal® are proven and perfect blending partners for Cotton:

- Mercerization is possible
- Regularity is high
- Tone-in-tone dyeing
- Easy processing – e.g. combing can be omitted
- Robust and universal