Dorlastan in the Field of Weaving

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TEXTILES VERTRAUEN
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Asahi Kasei Spandex Europe GmbH
41519 Dormagen, Germany

DORLASTAN®

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gez. ppa. Schmidt	gez. Nahl
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1. Dorlastan in the Field of Weaving

The majority of textile goods produced in the world are woven fabrics. Due to their structure, the stretching and elastic properties of woven fabrics are rather poor. Knitted fabrics are far better in this respect. Thanks to Dorlastan it is possible to also produce woven textiles with adequate extensibility and long-lasting elasticity. The customers' demands for more comfortable functional clothing has led to more and more woven fabrics being produced containing elastane. Today, a considerable share of woven fabrics, produced for leisurewear or for conventional outerwear – two typical fields of application for woven articles – contain Dorlastan. Elastane yarns are very efficient in this field of application. Even a small percentage (2-3%) is sufficient to provide the desired stretch properties of a woven fabric. In addition to the percentage of elastane, the fabric construction and the finishing are important for the final properties of the textile (for detailed information please refer to „The Dyeing and Finishing of Elastic Woven and Knitted Fabrics“).

1.1 Yarn Stage/Combination Yarns

In circular knit and warp knit fabrics, the extensibility and elasticity are mainly achieved by using bare Dorlastan. This is not possible in weaving. The production technique (weft insertion) does not allow this solution because insert tension and elongation can not be consistently maintained with bare elastane. Both must be accurately controlled to produce consistent fabric stretch properties for subsequent production steps (cut and sew). For this reason, elastic combination yarns are used in the field of weaving. There are various combinations depending on the production methods used. With all of them the Dorlastan is precisely stretched and then covered by non-elastic staple fibers or filament yarns. This means that the Dorlastan is located in the center of the yarn combination and is covered by a non-elastic thread. It is this covering that limits the extensibility and maintains the tensile force at a constant level. The covering yarn determines the interplay of force and elongation during the weaving process and, thus, also the elastic properties of the finished articles.

Below you will find a short description of the various combination yarns and their main fields of application.

1.1.1 Conventionally Covered Yarns

Conventional covering is still one of the most important production techniques for elastic combination yarns. The elastane yarn is precisely elongated through a hollow spindle, covered by the covering yarn and wound on cross wound bobbins. There are single and double covered yarns. In the case of the single covered yarn, the elastane thread is only covered in one direction, either S-turn or Z-turn. The double covered yarn is covered crosswise, i.e. in the S and the Z direction.

One disadvantage with single covered yarns is their tendency to twist which complicates further processing. The twisting effect can be reduced by thermal treatment (steaming), this reduces the extensibility. This effect can be reversed nearly 100% by shrinking during the finishing process.

In the case of double covered yarns, the inner covering regulates the stretch and the outer covering compensates for the twisting tendency of the yarn. The good coverage of the elastane yarn by this method (protective effect) means these yarns are perfectly suited for articles that must be extremely durable, e.g. cover fabrics for automobiles (seat coverings and door panel's).

1.1.2 Elastic Twists

There are essentially two methods for producing elastic twists:

a) Two for one twisted yarns

The elastic component of these twists is usually a single covered yarn. It is assembled with a non-elastic spun yarn on a high-speed assembly winder. The subsequent twisting will be done on two for one twisting frames. The elastane yarn is covered very well in twists produced by this method. Finished articles made of such yarns have a very high service performance (performed very well in end use/high abrasion resistance).

Elastic two for one twists may also be produced by using a bare Dorlastan. The covering operation is replaced by a assembling and drafting operation. This will be done on assembly winding machines fitted out with feeder rollers to adjust the Spandex draft. During this operation the elastane yarn is stretched and simultaneously assembled with the non-elastic fiber components. The twisting of this yarns is performed on two for one twisting frames.

b) Twisting by means of the „Elasto-Twist“ process

In the „Elasto-twist“ process, the Dorlastan thread is covered by a staple fiber or filament yarn. For this purpose the Dorlastan yarn is led through the hollow spindle. The hard yarn is wound on a pre-twist flanged bobbin (HD bobbin) that is subsequently put into the tube spindle. During the twisting process the HD bobbin rotates with the spindle which is fitted with a cover which hermetically seals the bobbin interior in order to avoid dirt deposits. The Dorlastan thread remains free from twists and is completely covered by the hard fiber yarn.

1.1.3 Air-covered Yarns

The Dorlastan thread is fed to an intermingling jet together with the non-elastic covering yarn (filament yarn). By intermingling the covering yarn, the components are bonded together. This method is characterized by high processing speeds. Twist deadening is not required. The covering is not as good as with the conventional yarn covering method. This covering method becomes more and more important because of its high processing speed.

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1.1.4 Core Spun Yarns

Core spun yarns are produced on regular ring spinning machines that have special take-off (feeder rollers) and guiding devices for guiding and stretching the Dorlastan core thread. When the fiber material leaves the drafting system it is combined with the Dorlastan thread. The outcome is an Elastane yarn covered by fiber material. After spinning the core yarn is steamed and wound on cross-wound cones.

1.1.5 Siro-Spun® Methods

With the Siro-Spun technique it is possible to produce staple fiber with twist characteristic. Through slight modifications to the ring spinning machine it is possible to manufacture a spin-twisted yarn that is suitable for warp threads in one single processing step from standard roving yarn.

Instead of one roving yarn (like in core yarn) two separate roving yarns are fed to the drafting system of the spinning frame. The Spandex is guided between the two rovings. These yarns (components) are combined after the last cylinder of the draft field and scrambled by a certain TPM. With the Siro-Spun technique it is possible to produce a yarn with twist characteristic in one step. Thus, they produce a double-covered yarn consisting of individual twisted threads.

For the production of elastic Siro-Spun yarns the Dorlastan is combined with the two rovings via a second feed roller whereby the Dorlastan has a defined draft. After the spinning process the Siro-Spun yarn is steamed and wound on cheeses with the help of autoconers.

The majority of the combination yarns consist of the conventional covered yarns, twists, as well as core spun yarns, yarns produced with the Siro-Spun method and air-covered yarns.

The various combination yarns are used for many different fields of application. A clear delimitation is not possible. Table 1 gives an overview of the main fields of application.

	Outerwear	Sports/ leisure wear	Underwear	Tapes	Cover fabrics
Conventionally covered yarn	x	x		x	x
Elasto twist	x	x			x
Two for one twisted yarn	x				
Core spun yarn	x		x		
Air-covered yarn	x	x			
Siro-Spun yarn	x				

Table 1: Application fields of combination yarns

2. Warping of Combination Yarns

In order to be able to produce elastic woven fabrics with a stretchable warp, the combination yarn must be wound onto a warp beam. The yarn tension to be applied during the warping process depend mainly on the stress-strain behavior of the yarn being processed. The course of the stress-strain curve is greatly influenced by the way and type of covering of the Dorlastan core. Another influencing factor is the steaming process required for twist deadening.

For nylon-covered yarns, for example, the tensile forces should normally be set within a range of 0.15 - 0.3 cN/dtex. Elastic twisted yarns produced by using nylon-covered yarns from a combination containing wool, cotton or blended yarns show lower extensibility than pure covered yarns due to the additional twist. The force taken up by these yarns is higher and the tensile forces of the yarn are of the same size as non-elastic yarns of the same source.

3. Production of an Elastic Fabric

Elastic woven fabrics are often derived from already known non-elastic fabric constructions. The prerequisite for the production of an elastic article is initially that the non-elastic base fabric is constructed looser than normal in order to allow for a certain contraction of the elastic combination yarn. The combination yarns are worked in a state of maximum stretch, i.e. they are stretched until the covering material limits their extensibility. This applies equally both to the warp as well as the weft thread. This way, differences in width, irregular twill lines and bagginess are avoided due to the variations in tension during take-up.

When the thread is no longer subjected to tensile force, the fabric retracts due to the recovery forces of the combination yarn being processed until the recovery forces of the elastic yarn are in equilibrium with the compression resistance of the fabric. Compression resistance of the fabric means friction forces – particularly at the interlacing points – as well as the resistance of the non-elastic or covering yarns to stretching. Once an equilibrium of the forces is achieved, the fabric is in a more or less tensionless state. In this condensed state, it can be extended almost to the same extent which was achieved in the stretched state during the weaving process on the loom.

During the subsequent finishing the friction forces in the fabric structure are reduced by means of steam or aqueous floating and the equilibrium of forces is disturbed. The recovery forces of the combination yarn are reactivated, supported by temperature and mechanical devices and lead to a further condensed fabric.

3.1. Dyeing and Finishing of Elastic Woven Fabrics

The dyeing and finishing gives the fabric its final optical appearance and the properties desired by the maker-up. Particular attention should be paid to achieving and maintaining the desired stretch properties and at the same time acceptable dimensional stability.

To achieve the desired extensibility it is necessary to allow the fabric to contract during the finishing process. If the fabric cannot be condensed to the required degree within the framework of the usual working processes appropriate supporting measures (steaming, hot water treatment, shrinking on the tenter frame) must be undertaken. If, however, the shrinking properties of a fabric are greater than necessary for achieving the defined weights per m^2 and the defined width, heat setting in hot air is required for stabilizing the Dorlastan share.

The setting conditions (temperature and exposure time) depend on the excessive contraction force that must be blocked and on the load to which the Dorlastan is exposed during the operation that is required for the respective article. If undesired elongation occurs with an article during subsequent processing after heat setting and despite low-tension treatment, this elongation must be reversed by a final shrinkage operation (relaxation steaming, special treatment). At this point we should like to refer to the product information booklet „Dyeing and Finishing of Elastic Woven and Knitted Fabrics“.

3.2 Practical Examples

The calculation examples given below refer to the production of an elastic woven fabric with 20% stretch in weft or warp direction. The calculation is based on the known adjustment data for the non-elastic base fabric. The data for the elastic fabric may be deduced from the calculations shown in Table 2.

	Adjustment data on the loom		
	Non-elastic	**Stretchable in the weft**	**Stretchable in the warp (20%)**
Number of warp threads	4995	4995	4995
Reed width	166,6 cm	166,6 x (1 + 20/100) = 200 cm	166,6 cm
Reed density	300 threads 10 cm	250 threads 10 cm	300 threads 10 cm
Weft density	250 threads 10 cm	250 threads 10 cm	250: (1 + 20/100) = 208 threads/10 cm

Table 2: Calculation examples for elastic woven fabric

Figure 1 shows the changes in width of a non-elastic or an elastic woven fabric during the manufacturing process.

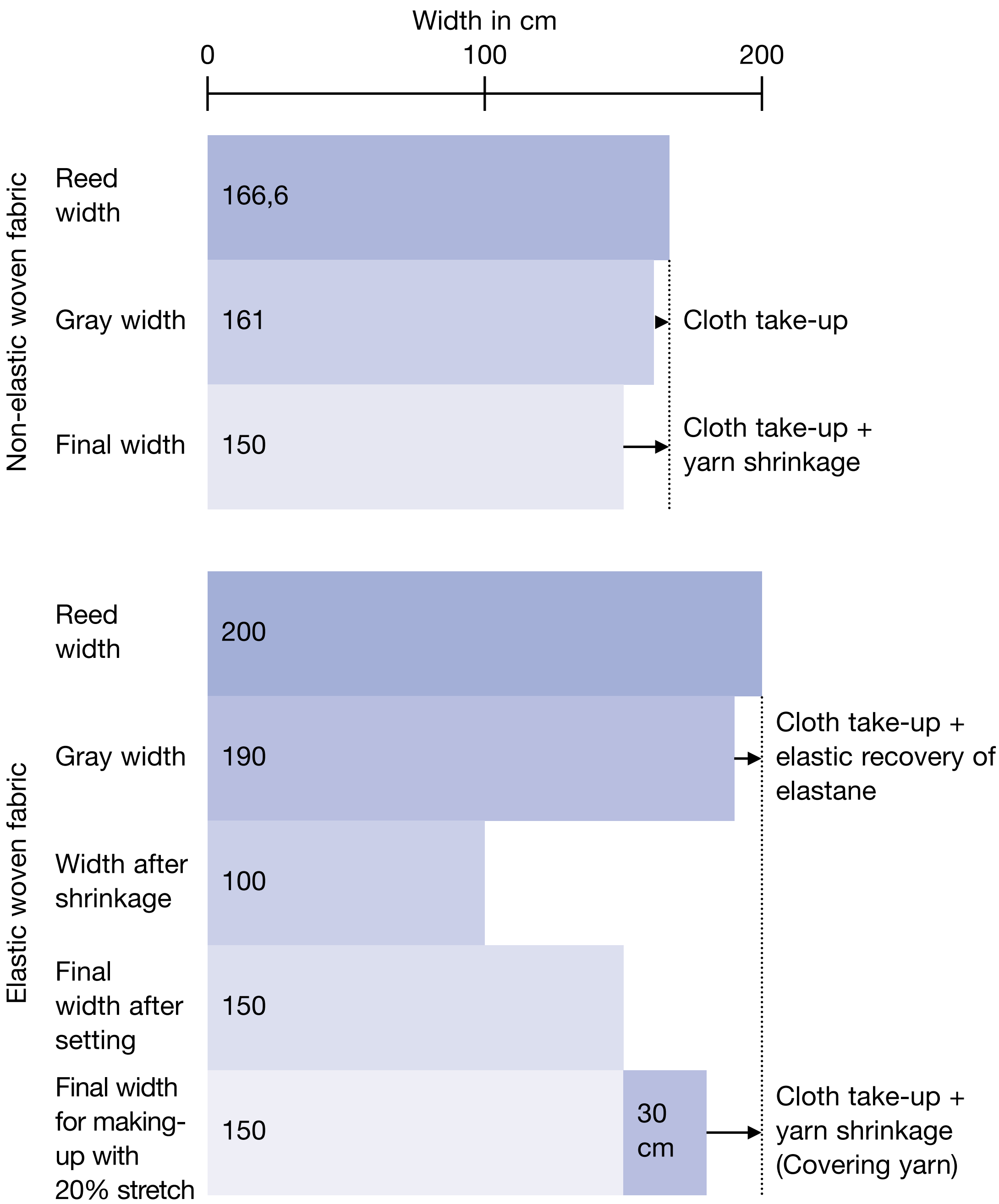

Figure 1: Changes in width of a woven fabric

Note

If you have any further questions concerning the field of weaving, please contact our department Marketing Dorlastan who will be pleased to be of assistance:

Dormagen, Germany	Tel. +49 21 33 / 51-40 04
Bushy Park, USA	Tel. +1 84 38 20-65 10