Presentation

Printing blankets design and manufacture technologies demand an amount of knowledge in several fields, such as organic chemistry, material's behaviour and multilayer composites design which fall far beyond the possibilities of one single person.

Similarly but in a much broader sense, textile technology depends from a comprehensive spectrum of operations and industrial activities before a cotton ball becomes finally transformed into, say, a printing blankets carcass component. It is the result of the concerted efforts of many Teams that cope with a range of opportunities offered by natural fibres.

A visit to a Classroom Lesson is suggested, in the document: Cotton-Missouri_minutes.

Textile engineers' professional activity taking place in a different world of their own, it is realised that an "interface card" may help in decoding printers blankets carcass requirements and making them better understood by textile experts.

And in fact, textile operations prior to weaving - such as, during spinning and multi single-yarn compounding or sizing - may also decisively influence fabrics' performance.

NOTE:

Consideration is being paid to a number of factors influencing the tensile, elongation and stability performance of textile-based carcass blankets.

The present document will focus on (high quality) cotton-woven fabrics, as used in 2-ply blankets.

But, following text may only contribute to an economically viable product improvement after specialised design scrutiny in a blanket's manufacturing environment.

Blankets reinforcement

In the vast majority of textile-based blankets, reinforcement consists of up to four fabric plies.

One ply, the "compressive ply", is applied between the surface rubber and the compressive layer.

Besides keeping the stamp distortion effect of the surface rubber layer to a suitably low value it also acts as a stabilising screen between the accurate image transfer and the handling of the required printing pressure.

The design of this ply will contribute to the desired printing characteristics of the blanket, while establishing a dimensional stability compromise that will avoid the compressive layer from sinking during the mounting operation of the blanket on the cylinder.

The remainder of the fabric plies lie under the compressive layer, building-up the blanket's carcass, meant to grant the dimensional stability of the blanket, as required to obtain image register.

The first ply of the carcass must be considered separately as most of its fabric cross-section is dry, rubber impregnation being usually limited to its internal face.

However, the type and the viscosity during application of the rubber compound used on this gluing interface will contribute in a greater or lesser degree to the hardness and to the dimensional stability of this ply. Just as an example, even a small of addition of isocyanate may tremendously increase the hardness and the stability of a properly manufactured fabric, while contributing to blankets' smash resistance reduction.

The first ply is usually the thickest being responsible for a large share of the blanket's tensile strength.

2-Ply Blanket

Further to the tasks already mentioned above, the compressive ply of a 2-ply blanket should also contribute significantly to the blanket's tensile strength as it can be observed on the typical two-bump "camel back type" shape of the respective Load = f(Extension) tensile strength graphs.

Also, to obtain enough tensile strength and simultaneously low mounting stretch together with small elongation figures during print, novel challenges have to be faced and new fabric options need be devised.

With the most common fabric concept used in printers blankets, a fabric cross section taken at a right angle to the around dimension will show that warp yarn ends align in a straight line while filler yarns arrange themselves in markedly wavy-like paths, as they are inserted over-and-under the warp yarns.

That weaving arrangement means that the warp fibres are kept straight - with the best possible dimensional stability - but they are unable to form an ideal continuous and thin curtain. Filler yarn paths prevent warp yarns from touching each other.

An alternate approach has been considered for 2-ply blankets where warp yarns are designed to have a slightly wavy path, making it possible now for filler yarns to have also paths with reduced waviness.

With this arrangement the ends of the warp yarns form now two interrupted straight lines while the filler yarns act as central separators. In the space between every two adjacent filler yarns all warp yarns exchange their relative position from one face of the fabric to the other face.

In order that such a fabric can still have a reasonably high Elasticity Modulus along the warp direction two conditions are required:

- Warp yarns misalignment should be kept to the bare possible minimum.

This condition is already acknowledged by the blankets' industry, being current practice when this type of fabric is used in 2-ply blankets' carcass to split each filler yarn into two parallel thinner yarns.

And filler yarns' diameter should be reduced as much as possible.

- A fine net of warp points must be anchored.

Impregnation of one face of the fabric, with the introduction of an additional operation, or by the compound alteration of the inter-layers gluing rubber is to be considered.

This practice may probably mean that some blanket distortion will occur during the conversion operation, when extra operations and care shall be required in order to obtain exact format dimensions.

It may also not be practical to deliver these blanket rolls with sealed edges in exact format width.

However this appears to be a fair price to pay, should this procedure significantly increase blanket Elasticity Modulus while also reducing "blanket mounting" and "during print" elongation figures.

Glossary plus Comments

Spinning & Plying

Fibres (textile) Discrete elongated pieces, similar to lengths of thread.

Plying Is a process used to create a strong, balanced yarn. It uses two or more singles, each with its own twist, that are put together. The singles are now twisted together, in the opposite direction of the individual singles own twists. When just the right twist is added, a balanced yarn is created, with no tendency to twist upon itself.

Multiple-single yarns obtained by plying will have their strength increased but they will also exhibit higher deformation and lower modulus. Thus, warp yarns formed by 2-singles with the desired cross section may be a preferable solution in order to obtain the highest warp dimensional stability. (2-singles plying is still required to obtain balanced yarns.)

Single The same as Spun Yarn.

Spinning Twisting staple fibres together into yarn.

Both single yarn tensile strength and its elasticity modulus depend on the type of the fibre, staple length and the amount of a twist during the spinning operation or the use of sizing. Twist - measured in turns per unit of length - is a handy means to control both the adhesion of fibres to each other and yarn's elasticity modulus.

Sizing is a general designation for the addition of chemical products to the fibres, intended to, temporarily or permanently, change untreated fibre surface behaviour, be it to reduce abrasion during weaving or other textile processing operations, or to chemically increase the bonding among fibres, as mentioned in Spun yarn.

It may be interesting to explore different elongation properties in warp and filler yarns.

Spun yarn Is made by twisting or otherwise bonding staple fibres together to make a cohesive thread, or "*single*".

Staple A fibre of a discrete length (as opposed to filament yarn, such as silk or synthetic continuous yarns)

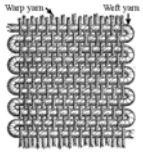
Staple length A property of staple fibres, referring to the average length of a group of fibres.

Thread A kind of thin yarn used for sewing.

Two-ply A yarn plied from two singles, a six-ply yarn is plied from six singles, and so on.

Yarn A long continuous length of interlocked fibres (see spun yarn)

Yarns A number of singles, which are known as plies when grouped together. These singles of yarn are twisted together (plied) in the opposite direction to make a thicker yarn. Depending on the direction of this final twist, the yarn will be known as s-twist or z-twist. For a single, the direction of the final twist is the same as its original twist.



Weaving

End (or warp end) Each individual warp thread in a fabric

Warp The set of lengthwise yarns that are held in tension

Weft (or filler) The yarn that is inserted over-and-under the warp threads