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Introduction

This information bulletin describes techniques for weaving Ingeo™ fiber yarns into fabrics with the desired Functional and Aesthetic characteristics. Although Ingeo™ fiber yarns, Friction Textured Filament and Ring Spun Staple, exhibit many attributes similar to other synthetic fiber yarns, they are a new, unique category that requires modified fabric formation techniques to maximize the benefits of the Ingeo fiber.

As Ingeo™ fiber is from a new category of polymer, PLA (Poly Lactic Acid), there is much information that remains to be understood. The information contained in this bulletin is the most current information available and will be updated as more knowledge is gained.

The use of any environmentally hazardous substances during the processing of the Ingeo™ fiber would be contradictory to the environmentally friendly advantages of the fiber and must be avoided.

General

There are several fiber characteristics that need to be considered during the processing of the Ingeo™ fiber yarns into woven fabrics. These characteristics, and the processes that would need to be modified to accommodate them are listed below:

- Melting temperature: The Ingeo fiber's melting temperature is 165° C to 170° C. However, the fiber should not be exposed to

any temperature exceeding 130° C. Consequently, this temperature should be kept as the limiting factor during slashing.

- - Fiber Elongation: Though Ingeo™ fiber yarns are relatively high in final tensile strength, they are easily stretched due to their high elongation. Care must be taken at all stages, warping, slashing, and weaving, to ensure that tensions and stresses on the yarns are kept as low as possible to minimize the risk of introducing thin places or unexpected residual fabric shrinkages.
- - Hydrolytic degradation: As the Ingeo fiber is susceptible to hydrolytic degradation when exposed to Highly Alkaline wet processing at elevated temperatures, consideration should be given to the type of size, and the required wet processing conditions for its removal before dyeing.
- - Fiber frictional characteristics: As the Ingeo fiber has high cohesiveness, care must be taken that the yarn has adequate lubrication to facilitate package take-off, and sufficient compaction when a Friction Textured Filament yarn is used, in order to be protected during weaving.

warping

Tensions should be kept low as outlined above. In general, 0.3 to 0.35 g/Denier has been adequate for warping without compromising the fiber's stretch characteristics nor the warping efficiency. Where Friction Textured yarn is to be used in the warp then this should be clearly specified to the yarn supplier to ensure sufficient lubrication (0.75% oil content if the yarn is to be sized), and a high degree of interlacing (normally 110 tacks/meter level).

When warping spun Ingeo fiber yarns and a break occurs, care should be taken that the ends are tied two inches above the break point of each end. Due to the high fiber resiliency the yarn tends to un-twist near the break point and create a weak spot

sizing

Friction Textured Filament Ingeo™ fiber yarns have been warped and woven successfully without sizing. These yarns were specifically prepared with 1.75% oil content minimum, and a compaction level of 110 tacks/meter (NSY, no size yarn). However, the success of being able to use the Ingeo fiber Friction Textured Filament yarns depends on many variables. These include yarn Denier and filament count, fabric construction such as density and weave design, loom type and operating conditions.

Size selection, as outlined before is dictated by the conditions necessary for its removal during wet processing. Both PVA and Polyester (WD size from Esatern Chemicals) are suitable for sizing the Ingeo fiber yarns. Both can be applied in relatively mild conditions, size solution and drying temperatures). Also both can be washed off at mild alkaline conditions (below a pH of 7.5), and relatively low temperatures (normally not exceeding 80°C). Further yarn lubrication can be achieved by a kiss roll application of an over-oil after the yarn has been sized and dried, before the Slasher Reed.

The amount of size required on the yarn is dictated by the amount necessary to have a good encapsulation of all the yarn fibers. Typically, for a Filament Ingeo fiber yarn 4 to 5% size pick-up, and for staple yarn 8 to 10% size pick-up have produced good results.

Typical sizing conditions for filament Ingeo fiber yarn are listed below:

- Type of size; PVA mixed at 10% solids solution
- Size box Temperature 35 to 40°C
- Drying temperature of 75 to 85°C
- Neutral to slightly overfeed (6%) warp sheet tension.

weaving

No special points beyond those normally used for the fabric construction/yarn counts/loom types have been noted in weaving trials to date when correct warp yarns and preparation have been followed.

Key points to keep under consideration are as follows:

- Greige fabric construction should be planned so as it takes into consideration a 15 to 20% greige to finished fabric shrinkage.

- Warp tension should be kept at a minimum. Usually slightly higher than the tension required to form a good shed opening. However shed height also needs to be considered and kept at a minimum in order to minimize the cyclic yarn tensioning during weaving.

- A reed with the maximum Air space is also highly recommended as it reduces the yarn to yarn friction and the possible Velcro effect.

- Weft yarn tension should be carefully controlled. In the case of the spun yarns in the weft, care should be given that the accumulator brushes are not stiff and abrasive.

- Loom speed is also a variable that needs to be considered and adjusted to keep loom stoppages to a minimum.

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