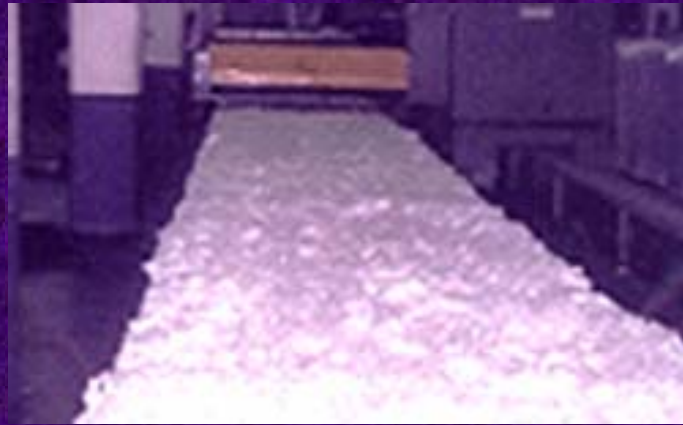


Spin to weave the world with Lyocell



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Innovation is the key to the future; Invention the key to success; this thought process led to TRADC which matches a varied set of objectives from producing new fibres to providing research facilities and solution to the value chain partners.

Here they have shared the key features of LYOCELL

Strongest Cellulose fibre

Lyocell has by far the best strength amongst fibres with a natural cellulose origin.

Property	Lyocell	Viscose	Cotton	Polyester
Fiber Strength (cN / tex)	> 37	24 - 26	21 - 35	46 - 54
Elongation %	12-15	19 - 21	7-9	22 - 24
Wet - Dry Tenacity Ratio %	82 - 84	50 - 52	108 112	100

High Moisture Absorbency

The moisture regain of Lyocell is 13% and it transports moisture effectively. Garments and made-up with Lyocell therefore have a high degree of comfort and is pleasing to touch.

Skin Friendly

Lyocell is high in purity and is a preferred choice for next to skin applications.

Excellent Lustre & High Colour Depth

Lyocell imparts excellent colour depth and lustre to fabrics, garments and made-ups which remain true, even after repeated washing.

Fibrillation and Seude Effect

Lyocell has an inherent dry surface structure made up of multiple micro fibrils.

Unique Drape and Fluidity

Lyocell yarns are compact by nature and its fabrics exhibit a unique behavior post wet processing.

It is having Lyocell characteristic like skin friendly, luster, color depth, fibrillation and suede effect. Lyocell fabric gives unique drape and fluidity and good wash and wear characteristic. It is used in shirting, suiting and dress material.

To meet all above quality, we need to understand the fibre behavior in spinning, weaving and processing.

Spinning of Lyocell

Bale laydown

Birla fibre has significantly less bale to bale variation than cotton, as many bales as possible should be used in each laydown. This will ensure that fibres are thoroughly blended.

Blending

Both manual and automated systems can be used. It is clear, however, that automated systems facilitate better, more intimate and controlled blending.

Double opening is recommended for the Lyocell fibre for better yarn quality. The double opening should be done after conditioning.

Parameters for Blending / Mixing / Blow Room

Conditioning	Temperature – 27°C, Humidity – 65% RH, Hours for Conditioning – 24Hrs.
Blending/Blow Room	No. of Beating Points – 3, Lap Weight/Feed- For Card Hank < 0.16 : 400 g/M For Card Hank > 0.16 : 350 g/M
Spin Finish	Appropriate Lubricant (If Required) 0.2-0.25% and Water – 1.0%

Spraying

Sprays are not needed on fibre if the atmospheric conditions are maintained properly. If the atmospheric conditions are very dry then spin finish is required but already the atmosphere condition is maintain properly.

Carding

The vast majority of short staple Lyocell fibre used in yarn manufacture is carded using chute feeds and revolving flat cards.

Generally, if cotton and viscose have been processed, little adjustment will be needed. If polyester and especially acrylic fibre, has been processed previously, then a marked change will be required.

Feed weights of between 500 and 900g are usual with card drafts from 100 to 160. In general, older cards will require lighter weights and lower drafts.

Card settings

Carding machine is heart of spinning. Proper setting always decides its imperfection at the final yarn quality. Closer setting, higher licker-in and cylinder speed is recommended for Lyocell.

E.g. For LC 300A Card

Description	1.2x 38 Viscose	1.2 x 38 Excel
Licker in speed	800 rpm	950 rpm
Cylinder speed	350 rpm	450 rpm
Cylinder to L-in setting (thou)	10/10/10/12/12	8/8/8/10/10

Card Wire Specifications

	PPSI	Height (mm)	Rib Width (mm)
Cylinder	720	2.5	0.7
Licker In	4 TPI	5.5	-
Doffer	388	4.0	0.85
Flat	330-400	8	-

Drawing

Lyocell fibre processes on all types of Draw frame in short staple mills. Final sliver quality is dependent on the type and age of the draw-frame. Two passages of drawing are commonly used.

Drafts depend on sliver weight requirements, but a high back zone draft on first passage (around 1.7) and lower on second passage (around 1.3) gives good results on a wide range of draw-frames.

Roving

In general, Lyocell processes well on most roving frames, with low break rates, good regularities and much less fly than either viscose or cotton. It is possible to introduce thin places into the yarn which are difficult to detect.

At the creel, prior to the back roller, it can be beneficial to introduce a slight tension on the sliver to minimize any kinks and curls. The rear zone draft should be relatively low - between 1.1 and 1.2. Higher values markedly increase thin places in the yarn. In sliver, EXCEL® fibres are very straight and parallel, and will give rise to a high cohesion, which increases with twist.

On older flyer frames with top hung flyers, setting of tensions is critical. High tensions lead to long thin places in yarns and poor weaving efficiencies. The problem is identified only by monitoring the H1/I1 thins category on the Classimat tester. The problem will be increased by flyers that vibrate badly. Good maintenance is essential. Increasing the roving twist reduces the problem but may lead to drafting problems in spinning.

Ring spinning

Drafting

Back zone drafts should be between 1.12 and 1.16, although the roller setting is not critical on SKF type double apron drafting systems. For other systems, a close rear zone setting may improve yarn regularity.

On some long ring frames, break drafts as low as 1.06 may be required to overcome roller vibration. Main drafts should be higher than 15, and around 30 is the most common. Soft top rollers, as low as 65 Shore, will undoubtedly give the best yarn quality, but they are more susceptible to wear and damage.

Atmospheric conditions

Atmospheric conditions of 23-28°C and 45-50% RH give the best processing performance. Drier conditions give more fly and hairier yarns, with a tendency to lap at end breakage. Wetter conditions can lead to fibres sticking to aprons, particularly when stopped, and even for as short a time as doffing. Humidity has a more marked effect on processing performance than temperature, and therefore should be well controlled.

Yarn steaming

Steaming Cellulosic fibres, including Lyocell fibre, affects a number of fibre and yarn properties: fibre dye affinity, yarn twist liveliness, and yarn splice strength. The effects are variable, depending on the steaming conditions; therefore care should be exercised in the steaming operation.

Best practices for autoclaves should always be followed:

- Dry (supersaturated) steam should always be used;
- As high a vacuum as possible should be applied prior to steaming;
- Consistent conditions should be applied from lot to lot;
- The autoclave should not be used cold.

Where steaming is required, e.g. for very high twist yarns, and for certain two-fold yarns, good control of the steaming conditions is required.

Weaving of Lyocell

Woven fabrics can be produced from Lyocell yarns through all the conventional weaving systems, with no major changes to those techniques used for other materials.

Warping

Lyocell yarns can be wound onto beams by both direct and sectional warping techniques. Warping speeds will depend on

- Ends per inch / yarn count combination.
- Production speeds from 200 to 1000m/min are in use commercially.
- In case of the Lyocell yarn is approx. 40-50 gm, although higher tensions have been beneficial in some instances.

- As Lyocell yarns are very strong, there should be few yarn breaks.
- If stop rates are excessive, the cause is usually either poorly-wound cones, or poor yarn splices.
- If yarn snarling is observed, recommended to do conditioning of the cones and optimize the yarn tension at creel.

Sizing

- The sizing of Lyocell yarns can be carried out on all staple yarn sizing machines, most of settings remain same as other cellulosic fibres.
- Size paste should be properly cooked.
- Continuous circulation of size paste in Saw-bow.
- Warp density in the size box should be as low as possible to ensure an even film of size is applied around the yarn (Approx 1.5 times Yarn dia. distance from two ends).
- In case of Lyocell wet splitting is recommended to reduce yarn hairiness. This is beneficial for heavy construction fabrics and is particularly advantageous for high speed loom particularly, air-jet looms and for fine yarn count/high ends per inch fabrics.
- Size pick-up is usually 9 -11% (up to 30s Count), but will be higher for very fine yarns.
- Moisture content for Lyocell should be 7%.
- Stretch % should not exceed 1%.
- Size add on should be 8-20%, depending upon the yarn count & Loom type

Looms

- Lyocell can be woven on Air-jet, Projectile & Rapier looms using conventional techniques and settings.
- Avoid constructions being too tight, because of the strong swelling of Lyocell fibre in wet state.
- Air-jet looms are the most sensitive weaving machine to yarn and warp quality and the highest quality standards must be achieved to give good weaving efficiencies.
- Rapier looms are the least sensitive type of weaving machine to yarn and warp quality and allow the widest range of fabrics to be produced.
- In case of Lyocell, Looms with electronic control of tensions are undoubtedly the best for minimizing the stop marks.

Material Handling

In case of Lyocell, we should take special care during material handling:-

- Fabric take-up should be carefully controlled to prevent creasing of fabric, as Lyocell has a “strong memory” and you will find these crease marks again in the finished fabric
- Roller surfaces, e.g. sand rollers, and temples, should not damage the fabric surfaces. In many cases the damage may be evident until the fabric is in garment form and subjected to garment washing treatments.
- Care must be taken in handling fabric, and rolls of fabric, designed for garment finishing routes.

Processing of Lyocell

Lyocell is unique man made regenerated cellulosic fibre as it behaves different in wet condition. It has tendency to have fibrillation due to mechanical agitation in a wet condition. Looking to fibrillation properties, it is advice to process in open width form and use of optimum quantity of lubrication to avoid creases.

Process Flow in open-width

- Loom state
- Preparing the Batch
- Singeing
- Desizing-Pre scouring
- Alkali treatment-----Bleaching
- Drying
- Dyeing/Printing
- Chemical finishing (Cross linking)
- Sanforizing

Greige fabric test/ Boil test-

A boil test (shrinkage) of the greige fabric will help you to find exact final width and will show you if the construction is perfect. Keep in mind Lyocell yarn in comparison to cotton yarn has approximately 15 % less volume.

Peach skin- It is recommended to finish peach skin touch/surface in garment wash/garment dye process.

Singeing

Speed has to be dropped approximately 15% less in comparison to cotton.

Desizing

Cold pad batch bleaching system like e.g.

Visco-Combi-Batch from Ciba/Huntsman which is:

- Bleaching
- Desizing
- Alkali treatment (7 degree Baume') in one process step.

In common Desizing /washing take care to alkali pH because of very often used PVA size.

Washing-Hot wash at minimum of 75-80°C for complete removal of oil, wax or fatty substances.

Alkali Treatments

I Mercerizing

II Causticisation 110-120ml/l NaOH 50%
5ml/l wetting agent
pick up 100%

batching time=2mins

III KOH Sandoflex-A (23 degree Baumme' KOH)

IV Liquid Ammonia (NH₃)

Alkali Treatment- Because of high swelling of Lyocell® a strong “water stiffness” creates crease marks and insufficient processing flow during all wet processes. Also the finished garments will get wash crease marks during home laundering. Therefore an alkali treatment during preparing is highly recommended. After Causticisation approximately (110-120 ml/l NaOH 50%) or mercerization, the fabric will stay soft and “flexible” and proper process flow together with a perfect final garment will result.

Dyeing in open width, such as:

- cold pad batch
- Jigger
- pad steam
- E-Control
- wet printing/discharge printing
- Steaming/washing/soaping/neutralizing

Dyeing-Dyeing is similar to cotton or viscose. Affinity of the dye stuff is higher than to cotton and very close to Viscose.

Printing-Take care to have the required moisture in the agar/steam chamber, approximately 15 % higher moisture in comparison to cotton.

Washing/Soaping – is recommended to be done in open width.

Finishing- Cross linking is highly recommended to avoid fibrillating/pilling during home laundering.

Drying- Avoid over drying, maximum temperature should be 130 degree Celsius with optimum overfeed. (Set width on stenter should be approx 2-3 cm more than final width).

Chemical Finishing

- Resin finish with softener and/or functional products (e.g. water repellent)
- Impregnating on pad mangle
- Stenter drying
- Optional Calendaring
- Curing
- Sanforizing-Prior to Sanforizing a proper remoistening (minimum 12-13% residual moisture) is necessary.
- Final inspection

The authors are associated with Textile Research and Development Center (TRADC). The center is having infrastructure of composite mill for research purpose. They are

www.fibre2fashion.com



regularly developing new products using Birla Viscose, Birla Modal, Birla Excel fibre and giving technical service to all textile industries.