

Precaution for Cellulose knit fabric to achieve required dimensional stability

Dimensional stability is defined as behavior changes in Longitudinal and transverse directions of the fabrics in relaxed condition. Natural cellulose like Cotton change its dimensions by +/- 5 % .talking some examples Viscose knitted fabrics tend to change its dimensions by -5% to + 20 % in relaxed conditions or it can be said that Viscose knitted with Spandex or Lycra tend to change its dimensions by -3% to + 10 % in relaxed conditions

Dimensional stability is an important phenomenon in Garment shape during usage and home laundry.25 Lakhs Garments made out of Viscose and from its blends every month. Prioritizing the customer requirements to grow the business further attention should be focused on Dimensional stability of Viscose based products.

Cotton knitted fabrics has good dimensional stability and it accounts 90% (1125 Lakhs) of the apparel requirements were Viscose accounts merely 2 %

To take a look to the technical influencing factors of Viscose Knitted fabrics for dimensional Stability we can take into account the controllable and uncontrollable factors which amounts for the dimensional instability in the knitted fabrics.

The controllable factors are those whose parameters and amendments are under our control and can be changed as per the changing input parameters. In brief we can summarize those factors as follows:

Controllable factors (X)

- *Suitable Yarn number for required Gsm*
- *Yarn Twist and Twist distribution*
- *Selection of suitable machine (gauge)*
- *Knitting, Dyeing and finishing Process parameter*

In general and particularly in case of dimensional stability uncontrollable factors are those which in general affect the dimensional stability of the knitted fabrics but are out of any amendments done positively. To summarize with, such factors are:

- ***Non Controllable Factors (Z)***
- *Fiber structure Amorphous Crystalline region ratio*
- *Fiber Elongation %*
- *Moisture Absorption%*

To avoid dimensional instability yarn should be of particular count, for particular gsm and also knitting, dyeing and processing factors should be taken care of which has vast influence on fabric dimensional stability. Some other unavoidable factors are twist factor in the yarn, Machine gauge, knitting tension and loop length.

Other reasons are also there which indirectly affect the issue, which are fiber amorphous and crystalline ratio structure, fiber elongation, moisture absorption etc.

Yarn Selection Criteria:

Count being the most important factor here, select suitable count as per the finished fabric GSM (Grams per square meter) requirements and always consider 5-7 % finer in yarn count as compared to 100 % Cotton enables to lay yarn loops with closest possible distance also yarn should be with optimum Twist Multiplier ranging from 3.2 – 3.5 and higher T.M leads undesirable dimensional stability and lower T.M affects abrasion properties of the knitted fabric and twist distribution in the yarn should be uniform. Care should also be taken to condition the yarn properly with 65% R.H for at least for 24 Hrs before taking up for Knitting.

Yarn strength should be at least 14 CN/Tex with elongation % ranging from 10- 12 and CV% of elongation should be within 12-15 and it is an important phenomena in knitted fabric relaxation behavior also yarn should be as uniform as possible and unevenness in the yarn will directly affects the appearance of the fabric and always select yarn with USTER 25 Percentile level norms to get better fabric appearance.

To ensure better working performance in Knitting machine, always Waxed and Spliced yarns should be used (coefficient of friction should be in the level of 0.15) with wax pick up level 2-3 % and higher wax pick up level leads uneven dyeing (streaks).

Yarn should always be used from the same lot, to avoid mix ups of the Lots. Always follow FIFO (First in First out) material flow methods. Use always same size cones in feeding which enables distribution of uniform tension during knitting process

To support such technical parameters under mentioned table can categorized under optimum levels of knitting parameters:

Knitting Parameters:

<i>MATERIAL</i>	<i>COTTON</i>	<i>COTTON</i>	<i>VISCOSE</i>	<i>VISCOSE</i>
<i>COUNT</i>	<i>30s</i>	<i>40s</i>	<i>34s</i>	<i>45s</i>
<i>M/c GAUGE</i>	<i>24</i>	<i>24</i>	<i>28</i>	<i>28</i>
<i>LOOP LENGTH</i>	<i>0.3</i>	<i>0.28</i>	<i>0.27</i>	<i>0.245</i>
<i>COURSE / INCH</i>	<i>32</i>	<i>36</i>	<i>37</i>	<i>42</i>
<i>WALES / INCH</i>	<i>35</i>	<i>38</i>	<i>40</i>	<i>45</i>

<i>TENSION stn</i>	5 gms	5 gms	3.5 gms	3.5 gms
<i>TENSION rng</i>	7.5 - 8 gms	7.5 - 8 gms	4.5 - 6 gms	4.5 - 6 gms
<i>GREY FABRIC GSM</i>	115 - 120	105 - 110	110 - 113	102 - 110
<i>GREY SHRINKAGE%</i>	-3 to +10'	-3 to +10'	-2 to +12'	-2 to +12'
<i>COMPACTING PRESSURE / SPEED</i>	+/-2.5'- 15 MPM	+/-2.5'- 15 MPM	+/-2.5'- 15 MPM	+/-2.5'- 15 MPM
<i>FINAL FABRIC EXPECTED SHRINKAGE</i>	+/- 3.5- 5%'	+/- 3.5- 5%'	+/- 5.5- 7.5%'	+/- 5.5- 7.5%'

It can easily area of interest that in case of viscose and cotton if we have to play between the gsm and shrinkage, because these are the areas of concern for dimensional instability, we need to keep either of the factors constant to put variation in other. As we know that initial shrinkage of viscose is more than cotton(for viscose -2 to +12' and cotton -3 to +10') so as per customer requirement if we want nominal final fabric shrinkage of viscose i.e. +/- (5.5-7.5%') and that also at almost constant gsm we can process that fabric under stretch conditions .

Fabric and mechanical Parameters

The miscellaneous factors to be taken under consideration while ensuring optimum process and machine factors are areas of concerns. For that we need to

Ensure the cleanliness of the Knitting machine before creeling the yarn cones and in the Knitting process by installing lint collectors

.Creel yarn cones and pass the yarns through feeding tubes, tensioned, stop motion and Positive feed regulator to feeder. Ensure proper functioning of stop motions.

Run the Knitting machine at optimum speed in 22 – 25 rpm level.

Check the yarn tension at the stationary stage by tension measuring meter and ensure uniform tension about 3-4 gm. in all feeders.

Fix the loop length as per count of the yarn and required final finishing GSM of knitted fabric and always take guidelines from the recommendations of the machinery manufacturer.

Check the yarn tension at the running stage by tension measuring meter and ensure uniform tension about 4-5.5 gm in all feeders.

Fabric take up tension must be synchronized with out put of knitted fabric from the Knitting elements and it should be always positive side.

Ensure proper lubrication of machine components and as well as yarn during knitting process.

Take 1 meter of fabric immediately in $\frac{1}{4}$ the of the fabric roll and check Gsm, loop length, course & Wales per inch and check boil shrinkage also to under stand dimensional stability

By optimum control over such technical, mechanical and environmental parameters one can assure the dimensional stability in the fabric.