

# PROCESSING OF POLYESTER FABRICS IN INDUSTRIES

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Initially, the organized textile industry was not allowed to weave filament warp yarns. This privilege was reserved for weaving units in the decentralized sector – power looms and handlooms. Gradually the Textile Policy in June 1985 was changed, and it was open to the organized textile sector. At that time, they had to face stiff competition with the power looms. It was very difficult to weave filament warp yarns on the overpick looms. Then the automatic looms were preferred for weaving filament warp yarns. At that time in India, only the twisted filament yarns were being woven. Later, the mills started weaving zero-twist or low twist filament yarns. Mills in Ahmedabad, Surat, Bhiwandi, and Bhilwara started making polyester sarees, suiting, shirting, and dress materials.

## **Polyester fabrics are made using the following yarns**

1. Filament yarns.
2. Textured yarns.
3. Spun yarns.

Filament yarns are made in monofilament and multifilament forms. The direction and amount of twist are determined by the desired end-use. The commonly used filament yarns have

- a. Zero Twist.
- b. Low Twist up to 200 TPM.
- c. Medium Twist up to 800 TPM.
- d. High Twist up to 1500 TPM.
- e. Extra High Twist up to 3000 TPM.

Textured Yarns are produced of polyester multifilament. They are given a texturizing either in conjunction with the drawing process or subsequently as part of the throwing and texturizing process in producing the finished yarns.

## **The most textured yarn used is**

- a. zero twists.
- b. Low Twist up to 200 TPM.
- c. Medium Twist up to 800 TPM.

Spun yarns are made of polyester staple fibers. It may be bright, semi-dull, or dull. It may be regular, medium, or high tenacity. The count varies from 2/20 s to 2/50 s. Depending on the end-use yarns are used to make the desired fabric.

Besides the above three yarns another yarn is also used in making polyester fabrics are called Tangled yarns which are Aero set or Rotoset.

Except for spun yarns all the other yarns are made from basic flat yarns. Compared to all spun yarns, generally the filament yarns are stronger. The filament yarns are designated as denier / number of constituent filaments/twist. The figure 80/36/600 filament would indicate 80 deniers with 36 filaments and 600 twist per meter. Generally, a filament yarn with a greater number of filaments will produce a fuller fabric than another filament yarn of equal denier but with a smaller number of filaments. The zero twist filament yarns produce better cover than the twisted filament yarns. The textured yarns produce fuller fabric compared to flat yarns.

The Surat Man-Made Textile Industry is the largest concentration of looms in

the world weaving man-made filament fabrics. Growth of processing activity in Surat occurred out of necessity. During 1970-80, Surat city witnessed the setting up of two giant co-operative markets

1. Surat textile market.
2. Bombay market.

These attracted attention of traders from all over India. Man-made textiles especially nylon and polyester sarees from Surat, became famous in all corners of the country. It is well known that each of the 150 process houses in Surat have a capacity to dye/print from 15,000 meters to 50,000 meters a day.

The involvement of traders in processing activity has beyond doubt contributed significantly to the growth of process houses.

## **Properties of polyester fabrics -**

Fabrics made of regular tenacity polyester filament yarns are very strong and durable. They do not have a high degree of elasticity which means it is characterized as having a high degree of stretch resistance, which means polyester fabrics are not likely to stretch out of shape too easily. This property

makes polyester suited for knitted garments, sagging and stretching that would ordinarily occur are reduced.

Polyester fabrics have good dimensional stability. It has got a high degree of resilience. Not only does a polyester fabric resist wrinkling when dry, it also resists wrinkling when wet. For example, a suit of polyester will keep its pressed appearance after many wearings, even after exposure to rain or moist, humid

weather. Fabrics of polyester filament yarn have satisfactory draping qualities. The trilobal filament type is more supple and imparts better drapability. spun yarns are also more flexible and softer, thereby imparting the draping quality.

Polyester fabrics are better conductors of heat than acrylic fabrics. Polyester fabrics have low absorbency as a result it will dry very rapidly since almost all the moisture will lie on the surface rather than penetrate the yarns. So polyester fabrics are well suited for water-repellent purposes, such as rain wear. This low absorbency means that polyester fabrics will not stain easily except oil which has got affinity for polyester, and it is difficult to remove.

The main disadvantage due to low absorbency is polyester fabrics are clammy and uncomfortable in humid weather because they will not absorb perspiration or atmospheric moisture.

There is essentially no water shrinkage of polyester fabrics; therefore, shirts, blouses and even slacks may be safely laundered. When ironing polyester fabrics, it is best to use low to medium heat. excessive heat will cause polyester to melt. The wrinkle resistance of polyester is extremely good. Polyester fabrics made from spun polyester yarns tend to pill. Polyester fabrics shrink as much as 20 % during wet – finishing operations and they are generally heat-set in later treatments. Polyester fabrics are better suited for outdoor use because it has good resistance to degradation by sunlight. They are resistant to mildew.

**Pretreatment of polyester fabrics** - Following are the steps for pretreatment of 100% polyester fabrics.

**1. Drumming** – It is carried out in Rotary Drum

HTHP machine. It opens the yarn twist thereby giving grainy effect to the fabric. The MLR is 1:4 – 1:6. Kleenox TEP (Rossari Chemicals, Mumbai) is used 0.3 to 0.5 % o.w.f. The pressure is 2-3 kgs/cm<sup>2</sup>. Holding time is 45-90 mins.

**2. Desizing** - It is meant for regular and water jet loom sizes i.e PVA and

Na –salts of Acrylate

co-polymers. HTHP Jet dyeing machine is used. MLR is 1:4 in U-tube and

1:8 in long tube.

Add Kleenox BAS (Rossari chemicals, Mumbai) - 1-2 gms/lit. Adjust pH 5.5 -6.0 with acetic acid. Run for 20 mins at room temp. Add Soda ash 2-4 gms/lit (pH 10- 10.5). Raise temperature to 100 deg c by 1 deg c /min gradient. Hold for 45-60 mins. Hot drain. Hot wash at 95 deg c

with 0.5 gms/lit Kleenox BAS for 10 mins. Cold wash.

In some units they are doing single bath desizing and drumming in the Rotary Drum HTHP m/c. It saves time and energy to avoid separate desizing process in different machine e.g., Jet or Jigger.

### 3. Scouring -

It is required for high twist 100 % polyester qualities. It is carried out as Single bath Scouring & Weight Reduction in HTHP Jet Dyeing machine. The MLR is 1:3 – 1:4 in U-tube. Load the material and give cold wash. Then add Greenscour CPM (Rossari, Mumbai) – 2-3 gms/lit Kleenox BASM (Rossari, Mumbai) – 2-3 gms/lit. Zylube CM (Rossari, Mumbai) (if reqd) – 1.5 gms/lit. Run for 15 mins at room temp. Add Caustic soda flakes as per weight reduction required. Raise temp to 120-130 deg c. hold for 30-60 mins. Hot drain. Hot wash at 95 deg c for 15 mins with addition of Oligo EM (Rossari, Mumbai) -1 gm/lit. Then neutralization with Oxalic acid – 4 gms/lit. Kleerix N (Rossari, Mumbai) - 1 gm/lit. At 90 deg c for 20 mins.

The basic finishing processes for 100% polyester filament yarn fabrics may be arranged in the following three sequences.

- Scour –Heatset – Dye
- Heat set –Scour--- Dye.
- Scour—Dye—Heat set.

### Dyeing of polyester fabrics -

There are basically two types of polyester fabrics

- Polyester knitted fabrics.
- Polyester woven fabrics.

Polyester knitted fabrics are used on a large scale for outer wear of all types. The main reasons for their success are the wide patterning potential, the good durability and crease resistance, and the excellent easy-care properties. Polyester knitted fabrics are composed almost exclusively of texturized yarn. To avoid creases and breakages, knitted fabric that have not been set should always be stored or treated in full width.

### The process sequence for circular knitted fabrics dyeing is as below.

Slitting --- pre-stabilization ---- Full-width washing -----Hydroextraction ----Drying ---Heat-setting ---- Dyeing ---- Hydroextraction-----Finishing-----Drying---Steaming.

Following are the precautions taken for the above process.

1. Circular knitted fabrics should be slit as soon as possible after knitting (within 24 hours). If they cannot be further processed immediately, they must be rolled flat, completely free from creases. If the goods are stored in tubular form for some time, the folds will become fixed.

2. Prestabilizing is necessary if the fabric is liable to become creased during precleaning or if the selvages tend to curl. This is done by running the fabric in a tensionless state through a steaming chamber ((saturated steam ,100deg c.); the fabric relaxes, and fibres begin to crimp.

3. Prior to dyeing, all spin finish, knitting machine oil and other impurities must be removed. At the same time washing develops the crimp which is lost in knitting.

4. Scouring is carried in continuous full width washing ranges using Soda Ash and good detergent. There should be provision of a “sojourn” zone, in which the fabric is able to relax completely without longitudinal tension. The shrinkage is often over 20 %.

5. After washing, rinsing, hydroextraction uniform drying is essential because variations in the residual moisture content are liable to cause uneven fixation, resulting in unlevelness in dyeing.

6. Heat setting is done in stenter at 150-

180 deg c for 20-30 seconds. The higher the setting temperature, the better the dimensional stability of the treated fabrics., but the handle becomes flatter and harsher if the setting temperature is too high.

7. Texturized polyester knitted fabrics are normally dyed at 130 deg c in high temperature winch –beck. it gives a full, bulky handle to the goods using medium to high sublimation fastness disperse dyes. It can also be dyed in Jet dyeing machines using defoamer, antitcrease agent etc.

#### The process sequence for dyeing of polyester woven fabrics is as below ;

Full width washing ----drying ---heat setting ----dyeing ---hydroextraction---finishing-----drying ----steaming.

Polyester fabrics can be dyed in the following machines.

#### a. High Temperature winch becks -

It is suitable to dye texturized polyester knitted fabrics. It imparts a full, bulky handle to the fabrics. Care must be taken to avoid running and other creases. The probable causes for creasing are

- poor suitability of dyeing machine.
- too heavy batch of fabric.
- incorrect loading of machine.
- dyeing

process (heating, cooling). The remedial measures are adjusted temperature programme and add a suitable lubricant.

#### b. Jet Dyeing machines – It is suitable for dyeing of polyester knitted fabrics and woven fabrics.

Following are the advantages of the above Exhaust dyeing process

- no tailing problems.
- better reproducibility.
- less fastness problems.
- good penetration.

Care must be taken to avoid Rope marks in jet dyeing machines which may be due to the following reasons

- improper heat setting.
- too low a fabric speed.

The remedial measures are

- ensures proper heat setting.
- at least 1 revolution per min.
- use suitable lubricants.

#### c. Beam dyeing machines - It is suitable for dyeing smooth knitted fabric and woven fabrics.

Following are the advantages of beam dyeing over winch beck dyeing

- short liquor ratio, and consequently low costs for energy, water, and dye.
- time saved in loading and unloading the dyeing machine.
- no trouble with running of the goods.
- less danger of unlevelness caused by variations in temperature in the dye-bath.

The disadvantage of this method is however, that bulky qualities may be flattened, so that the handle and appearance suffer. Besides this problem barriness is observed, which is unlevelness in dyeing material. By using suitable chemicals, it can be overcome.

#### d. Pad-Thermosol Process /Continuous Dyeing – It is suitable for polyester narrow fabrics. Following is the process sequence to be followed.

- padding – pick up -50 -65 %
- drying – 1 min at 130 deg c.
- fixing with hot air – 170 deg c to 195 deg c, 1-6 mins.
- cold wash
- reduction clearing - 70 deg c to 80 deg c, 1-4 mins.
- cold wash

Following are the advantages of the above process.

- no spirality problem.
- Flexibility of production.
- better workflow.
- More economical.

There is listing problem encountered in Continuous Dyeing. which may be due to one-sided liquor feed into the trough. Or different nip roller pressure or unlevel migration in intermediate drying or uneven thermosoling or fixation of

dyes due to temperature differences.

It can be overcome by strict quality checks in process, machine settings etc.

#### Finishing of polyester fabrics

Several finishes can be given to polyester fabrics to increase their usefulness.

Some of the important ones are as below.

- Antistatic
- Finish – for reduction of electrostatic build –up.
- Calendaring – for smoothness and reduced pilling.
- Compressive shrinkage - for increased shrink resistance.
- Embossing – for design and luster.
- Heat setting and stabilizing – for permanent shape retention, wrinkle resistance, and improved hand.
- Shearing – for smooth, even pile or nap.
- Singeing – for improved hand and reduced pilling.
- Water and Soil repellency – for comfort and ease of care.

Rossari chemicals, Mumbai has come out with special finishes which are used in the Surat market for 100 % polyester fabrics.

#### a. Zylan MAT - Mat Finish

- Dose 10 -15 gms/lit. It is suitable for bright filament –yarn qualities. It gives good bouncy effect. It gives Matt look with cotton feel.

#### b. Drybounce CST –Dose 10-15 gms/lit. It is suitable for both bright and georgette qualities of dress material with heavy weight reduction. It gives

very good bouncy feel with complete dry touch. It is suitable for both pad and exhaust.

#### c Innersol GTX - Dose – 5-10 gms/lit. It is suitable for 100 % polyester and blends. It gives wet feel with soft surface touch.

It gives smooth surface with inner softness.

#### d. Dry Peach - It is suitable for pad only. It gives very high bounce with dry

peach surface. More suitable for bright qualities of sarees and dress material. Following chemicals are used Zylon RS – 20-30 gms/lit.

- Ultima XT 50 – 15-20 gms/lit
- Drybounce CST – 5-10 gms/lit.

#### Important Fabric Defects –

Practically all fabric defects that occur in spun yarn fabrics can also occur in filament yarn fabrics.

- **Fabric Slip** – Fabric slip occurs when warp and weft yarns do not stay in their respective positions as these were placed during weaving on the loom. It is prominent in light construction fabrics. After heat setting the tendency to fabric slip reduces considerably. Increase in end pick density and warp-weft crimp and early heat setting help to reduce fabric slip. For slip prone fabrics special chemical finishes are required to overcome this defect.
- **Stitches** – In case of filament warp fabrics, it is the filamentation of yarns that is mainly responsible for formation

of stitches on the loom. Application of small amount of adhesive and ant-static agent has been reported to reduce the filamentation and hence warp breaks.

- **Shiners** – Shiners are a specific defect of filament yarn fabrics only. These are mainly caused by uneven surface of the blanket on sanforising, or zero-zero finish machine. Proper care should be taken during buffing of the blanket.
- **Temple Marks** – The temple marks are seen more prominently in filament warp fabrics. This is because with slight pressure the filament warp gets disturbed and leave behind permanent impressions. Temple spikes should not be blunt, and rings should rotate freely.
- **Formation of Balls on Fabric Surface** - Due to excessive abrasion of healds and reeds some of the constituent filaments break. These broken filaments are collected by the reed in the form of fiber balls which firmly adhere to warp and fabric surface.

But nowadays polyester fabrics has become a poor man fabric. But in 70 -80

s it was a rich man s fabric. Till date Surat maintains the name of synthetic city supplying polyester shirts, polyester sarees, dress materials to the whole of India and export to countries like Middle east and African countries. Polyester fabrics made from spun yarn are used for furnishing fabrics like sofa cover, Luxury bus seat covers, cinema halls seat covers, Aeroplane seat covers etc. The industries making the polyester fabrics for furnishing are in Gurgaon, Faridabad, Panipat etc.

There is good scope for polyester fabrics made from spun yarn, texturized filament etc for school uniform, police uniform, dress material etc. in Nigeria and other African countries. Reliance Industries has come out with very new type of polyester fibre which will give value addition to the polyester fabrics sector such as Cationic Dyeable Polyester (CDP), Easy Dyeable Polyester (EDP), Cotlook Polyester, Low Pill Polyester, Recycle Polyester, Fire-Retardant Polyester etc.

## NEWS UPDATE

### TEXEL INDUSTRIES LTD TO START COMMERCIAL OPERATIONS OF ITS 10,080 MT GEOSYNTHETICS PRODUCTS FACILITY AT KHEDA

Company has launched Rs. 12.49 crore Rights issue to fund the expansion; Rights issue open from 31 August – 14 Sep at Rs. 40 per share

Speaking on the development, Mr. Shailesh Mehta, Managing Director, Texel Industries Ltd said, “Expansion at our new facility in Kheda is going as scheduled and we plan to start commercial operations by end of September 2021. Post completion of the expansion, installed capacity of the company will double to more than 19,000 MT per annum. Keeping in line with its continuous efforts towards sustainability, Texel is now expanding its product mix to include various new products such as Roof Tile Underlay, Lumber Wrap, and a Floating cover for water reservoirs.

The floating cover is a cover for farm ponds and water reservoirs, which prevents 30% loss of water through evaporation.”

The company’s manufacturing facility is located at Santej, Gandhinagar, Gujarat having an installed capacity of 9,000 MT per annum. The management has successfully turned around the company and was able to rebuild stakeholder confidence with higher sales and profits, resulting in it getting deregistered from BIFR in November 2016. For the quarter ended June 2021 promoter holding stands at 40.77% – a rise of 647 basis points from 34.3% from June 2020.

For FY20-21, the company reported sales of Rs. 82.79 crore and Net profit

of Rs. 2.13 crore. For the Q1FY22, the company posted a healthy 51% growth in the net sales at Rs. 27.74 crore, Net Profit was up 70% at Rs. 75 lakh. The performance was achieved on the back of robust demand on the domestic markets in the Tier 2,3 cities & rural areas post unlock.

Company plans to raise up to Rs. 12.49 crore from the rights issue which is open for subscription from 31 August to September 14. Proceeds of the rights issue will be utilised to fund the proposed expansion in Kheda facility.

Post completion of the expansion, installed capacity of the company will double to more than 19,000 MT per annum.