Contamination in PV Fiber Dyed Spinning - A Big Threat to Yarn and Fabric Quality

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The contamination is one of the major challenges faced by spinners in India even though it is a non-technical issue in nature and needs only awareness on day to day administration on the production floor. The contamination, even if it is a single foreign fiber, can lead to the down grading of yarn / fabric / garments or even the total rejection of an entire batch of finished goods and can cause un repairable harm to the relationship between inter departments or between industry and customers also to some extent. The seriousness of contamination is very much clear from the report of International Textile Manufacturers federation (ITMF) that claims due to contamination amounted to between 1.4 to 3.2% of total sales of 100% cotton and cotton blended yarns. The earlier the stage of contamination, the more serious and expensive for the mills to remove contamination. The contaminants can end up in finished yarn and fabric. These contaminated yarns and fabrics become “Seconds”.

The contamination issue in PV dyed spinning is quite different from the grey cotton and grey PV mills. In this paper, you will find origin, nature, reasons and preventive measures of contamination control especially in PV fiber dyed spinning mills.

The following are the preventive steps needs to be taken on day to day working of PV fiber dyed spinning mills to make contamination free yarn. We can not eliminate contamination completely, but can be reduced to minimum possible level.

1.Inspection of Fiber Bales 2.Inspection of dyed fiber received from dyeing 3.Cleaning of machines during lot change 4.Running single delivery on twin delivery breaker DO6 draw frame 5.Running of Polyester during lot change 5.Segregating machines for light shades 6.Use of contamination detectors in Auto Winding 7.Running Single Weft qualities on contamination detectors 8.Use of partition cloth 9.Ban of compressed air for cleaning machines 10.Educating operators & supervisors to adopt better methods 11.Cleaning of return air trenches time to time 12.Good House Keeping 13.Workers using tight cloth & covering body properly 14.Adequate air changes in the production area etc.

Inspection of Fiber Bales: The bales must be checked externally for any physical damage including worn out packing cover. The small pieces of worn out packing cover stick to the fiber and goes into spinning machines , later on appear as contamination in the yarn and fabric. The fiber inside the bale must be critically checked through out its consumption for any contamination of other shades in the material from the supplier itself. In our experience, we observed fiber contamination in the received bales from supplier itself. If found in the bales, separate manually before using in the production and at the same time lodge the complaint to suppliers for analysis, corrective action and feed back at their end on the same day itself.

Inspection of Dyed Fiber Received from Dyeing Dept: The use of boras without proper cleaning leads to contamination when kept on circulating the same boras between dyeing and spinning. Some times, we

found contamination of other shades and of different fiber due to dyeing of different fibers/ shades in the same dyeing dept without taking proper care in storage and packing the same to deliver to the spinner. It is not a joke, we found worsted dyed material with polyester received from dyeing dept as in the same dyeing dept, wool/polyester are also dyed.

Cleaning of Machines during Lot Change: The machines must be cleaned thoroughly during lot change. The cleaning needs attention on continual basis, if you are running small lots. It has been observed that the time required for cleaning is more than production time that means utilization is even less than 50% in some cases when we run very small lots.

Running Single Delivery on Breaker DO6 Draw Frame: If light and dark shades are running one after other in the spinning, run only one shade at a time on the draw frame. Some times, under pressure of production, it has been observed that two different shades are running on draw from on each delivery on the same machine leading to contamination. In such cases, either make small cans of each shade & run one after other or run only single delivery with single shade at a time.

Running of 100% polyester during lot change : During change over from dark to light shades, in addition to cleaning the machine manually, short run the machine with white polyester which can pick all fibers of previously run shade with it and then run light shade. By doing this, you will not face major contaminations in the lap. It is tedious, time consuming, wastage of good material, but gives good results.

Use of Contamination Detectors in Auto Winding : Equipping auto winding machines with yarn clearers that detect and remove foreign matter or contamination of other shades of running side by side in the dept from the yarn before it is wound onto packages and delivered to the weaver. It is better to inspect the ring cops before running on Auto Winding. If contamination is observed, divert such lots to the auto winding machines except contrast/mixture shades where contamination clearers are installed. The types of contamination and the efficiency of removal depend on the sensors employed in these systems. With modern clearers, it is possible to detect the contaminations even not visible by the human necked eyes.

Use of Contamination Detectors in Auto Winding for Single Weft High Twist Yarns : In double yarns, the severity of contamination is less compared to single yarns to be used directly in weaving as weft. The running of all fiber dyed single weft high twist yarns except contrast/mixture shades on contamination clearers helps a lot in keeping contamination under control.

Use of Partition Cloth : The use of partition cloth between ring frames running on light and dark shades helps to great extent to reduce contamination of dark shades in light shades & vice versa. In areas other than ring frame, use of partition cloth between different sections is advisable to control contamination and time to time cleaning of accumulated fibers on this partition cloth. If an air change is poor, you need more such partition cloths in the dept.

Prohibition of Compressed Air for Cleaning the Machines : The use of compressed air not only leads to contamination in the shades running in the surrounding machines, but also resulting into starving machines for air leading to malfunctioning of machine electronic mechanisms. In the long run, it will

become regular practice of using air for self cleaning of supervisors and workmen also and use for personal cleaning is unsafe totally. In the unionized mills, stopping such practices after allowing for long period is hardly possible, but in some machines where manual cleaning is difficult practically, better to allow with strict control over it.

Educating Operators & Supervisors to Adopt Better Methods: It is better to develop internal trainers among the supervisors to give training on contamination in small batches on regular basis. The use of power point presentation, showing them defective yarn packages and fabrics rejected for contamination time to time, level of contamination and its contribution in total defectives, on line monitoring in the dept while working on the machines for improvement the contamination etc to be covered in the awareness training program. There must be some weight age to be given in their annual appraisal of supervisors to sustain their interest on continual basis.

Cleaning of Return Air Trenches : The cleaning of return air trenches particularly in ring frame area is required frequently depending on the level of air changes, speeds of machines and fly generation to keep track on floating fibers in the air. The suction must be strong enough to suck floating fibres instead of allowing them for swimming in the air.

Good House Keeping: This is very important aspect to look into at every minute. There is saying that "The well cleaned area is native of Goddess Lakshmi ". The maintaining cleanliness at shop floor not only helps to reduce contamination, but also develops healthy and self motivation among the workmen and supervisors. Even owners of the organizations/ visitors are all the time judging the performance on the basis of how well cleanliness is maintained in the organization.

Use of Tight Cloth & Covering Body by Workmen While on Duty : The use of tight clothing not only helps in reduction of contamination, but also helps in preventing accidents as loose clothing is very sensitive to caught in the running machines and carries fibers from one area and left at another area leading to contamination.

Adequate Air Changes in Production Area: The poor or less than required air circulation in the dept not only increase floating fibers leading to contamination, but also increases air pollution in the spinning area. This must be monitored, reviewed and change if required whenever there is replacement of machine or addition of machines or change in production speeds.

Cheese Dyeing of Pastel Shades: The volume of pastel shades is low compared to dark and medium shades and even their lot sizes are also small. They are inconsistent in requirement and we can not keep separate machines also and these are like randomly occurring events in nature. Such shades produce lot of contamination in neighboring shades as well as contaminate themselves. The cheese dyeing is better option for such shades.

Development of shades keeping shop floor problems in mind: The shades with white /odd component of either VSF or PSF or preferably VSF, some times suspect for contamination due to component of shade itself looks like contamination even though it is integral part of the same shade. In such cases,

either you drop the idea of development such shades or review fabric appearance treating it different class of fabric. Other wise such fabrics will mislead the customers leading to rejection.

Keeping spindles idle between shades: In PV dyed like ours, you will not find running single shade on one full machine and even on one side of 480 spindles ring frames. You won't believe running 8 to 10 shades on single machine is common practice. To avoid contamination on the bobbins at shade change over place on the ring frames, better to keep 1 or 2 spindles idle on ring frame and speed frame. In the unionized mills, where productivity linked allowance is part of wage agreement; one should compensate their monetary loss for loss of production on account of spindles stopped for contamination. The number of such idle spindles are increasing with increasing number of smaller and smaller lots also.

Employee Involvement: There are various tools and techniques available and quality circle is one of the simple, easy to form and implement on the shop floor. It is better to form quality circle on contamination issue and you will find some improvement as employees generate their own innovative ideas and them selves involve in implementation. This not only helps in reduction of contamination, but also helps them for their self development.

Running dyed and grey yarns under one roof: In the big organizations where huge number of varieties of shades are running as well as grey material, one can not avoid contamination even with strongest partition between dyed and grey shades.

Meeting with concerned stake holders: The time to time holding meeting is beneficial to bridge the gap between fiber manufacturers, machinery manufacturers, yarn manufacturers, designers, product developers and marketing team to avoid unnecessary conflicts.

Use of UV lights: These are required to detect contamination in yarn packages in the packing or delivery department to detect chemical, oily substances, lot mix-ups and presence of foreign fiber /matter contamination especially useful in grey yarn inspection. The effectiveness of these lights very poor in dyed yarns.

Use of Contamination Scanners: The installation of scanners in blow room line that can detect contamination and remove it from the fibers. These are effective in sorting foreign fiber / matter in grey spinning, but they hardly work in dyed spinning process.

Effects of Contamination

- Even after cleaning left over embedded pieces of contamination in yarn affect its quality and value
- The fabric appearance produced with the contaminated yarn will be very poor and prone to rejection
- The contamination can cause irreparable pain to the relationship between the inter departments or

- The contamination is expensive for the mills to remove contamination and if it is not completely removed, fabric is liable to classified under “Seconds” and sold with loss by giving discounting offer

- Some times , the contaminated fabrics are over dyed, but it increases dye consumption and can not be sold against its parent order as its over dyed shades are different compared to parent ordered shades. Either it will be sold in secondary market by issuing remake order to full fill the parent order

- Huge man power is required in picking the portion of contamination which leads into delay in delivery of fabric and adds cost to the fabric

- Manual sorting of the contaminations by employing ladies is a normal practice in large organizations, which although costly will give a good result, not only in getting a contamination free yarn, but at lower unevenness due to gentle picking of contamination by hand. How ever, this requires huge labor & space – that was not affordable. By adopting good work practices, the manual sorting can be reduced to some extent, but can not be eliminated

- The decision of rejection of the fabric or garments depends on the portion in which the contamination is present. How ever, the spinner has no control on this. He needs to work for producing contamination free yarn.

Conclusions

The control of contamination in dyed spinning is a joint and collective responsibility of fiber suppliers, work practices on the manufacturing shop floor, machinery manufacturers, design and product development as well as supply chain management, but among all these, the spinners is always in front because he is immediate supplier to weaving process and rest are behind the screen safely. The contamination is non-technical issue in nature and control is possible only with strict supervision. There is no single and one time solution for eliminating contamination. It is part and parcel of the dyed spinning process and needs continual attention as long as process is in existence. The one of the major reason for contamination is poor work practices. Some times, the management used it as tool of leg pulling of the spinners as it is never ending issue for the spinners. The contamination is more serious in dyed spinning compared to other grey yarn spinners.

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