Barre and the Influences of Yarn Manufacturing

by

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What is Barre?

A fabric defect characterized by textural bands or color bands in the course or filling direction.

In textile production, one of the most common and often perplexing quality control problems is barre. The factors which can cause or contribute to barre are varied and diverse and can generally be summed up in one or more of the following categories-raw materials (fiber), yarn formation and fabric formation.

From a raw material and yarn formation perspective, variations in fiber micronaire, yarn twist, and yarn count can all have adverse effects on fabric appearance and/or dye ability. This evaluation is specifically designed to determine the amount of variation in any one of these three areas which could induce barre in a finished fabric.

Barre and the Influence of Micronaire Variation

What is Micronaire?

A numerical value that describes relative fiber fineness and is derived from the micronaire method test which measures the resistance of a fiber sample to a flow of air

forced though it. (See attachment)

Phase1

Five bales of California cotton from the same growth area were selected with different micronaire values (3.4,3.8,4.2,4.6 and5.0). Ne 18/1 ring and rotor spun, carded yarns were produced from each bale. These yarns were knitted separately into jersey fabric and dyed blue for barre evaluation. The fabrics from each bale, in their pure unmixed from, proved to be barre free. At that point, yarn produced form the 3.4 micronaire fiber and yarn produced form the 5.0 micronaire fiber were knitted together on predetermined feeds. The resulting fabric exhibited highly visible barre. This procedure was repeated 2 more times, each time using 2 yarns produced form fiber with micronaire values of less difference: i.e. 3.8 and 4.96 micronaire, 3.8 and 4.2 micronaire. As expected, the color difference diminishes as the micronaire difference becomes less. The spectrophotometer results (Tables 1) show that fabric produced from 5.0 micronaire fiber produces 25% darker color than that produced form 3.4 micronaire fiber.

Table I

Color Strength Comparison (K/S)
4% Direct Blue 80

Micronaire	3.4	4.2	5.0
Ring Spun	11.97	14.68	15.69
Rotor Spun	13.27	14.85	16.71

The assumption has been for some time tat barre problems, caused by micronaire variance, were due to the difference in dye uptake between the thin cell walls of the low micronaire fibers and the thicker cell walls of the high micronaire fibers. Recent

laboratory analysis (Table 2) has given strong indication that this may be a general misconception. Per unit weight, dye exhaustion/fixation is essentially the same for the low micronaire and high micronaire fiber used in this comparison.

Table II

Exhaustion/Fixation Comparison*
4% Direct Blue 80

	3.4 micronaire		4.2 micronaire		5.0 micronaire	
	Ring Spun	Rotor Spun	Ring Spun	Rotor Spun	Ring Spun	Rotor Spun
% E	87.8	88.5	87.0	88.9	87.7	87.5
% F	63.0	64.0	63.0	64.0	61.0	61.0

* Transmission measurements of dye bath

It is important to notice, as the fiber testing results (Table 3) show, that as micronaire value increase, maturity and fineness tend to increase as well. This trend is consistent with our experience in the testing of those parameters.

Table III

Shirley Developments FMT
(Fineness Maturity Tester)
Results

Micronaire	Maturity	Fineness
3.4	0.77	156
3.7	0.80	168
4.2	0.82	190
4.5	0.90	192
4.7	0.91	200

Phase 2

Three blend consisting of three different micronaire ranges (3.4-5.0, 3.8-4.6 and 3.8-4.2) were processed separately into ring and rotor spun yarns of Ne 18/1. to carry out the experiment, small separate fiber lots were manually blended and then placed in an opening hopper. The jersey fabrics produced from each of these lots proved to be barre free.

Phase 3

Cotton from the 3.4 micronaire bale was placed in one opening hopper and cotton form the 5.0 micronaire bale was placed in a separate hopper. The two cottons were fed through the same cleaning line and into the same card. Sliver form the card was then processed through 2 drawing passes with 8 dens up in the creel for each pass. Ne 18/1 carded yarn was then knit into jersey fabric. This fabric proved to be free of any trace of barre.

Key points for blending optimization and the avoidance of micronaire variation barre are:

- Know the properties of each and every bale chosen for a laydown.
- Control the average and C.V% of those properties deemed most critical to the process.
- The difference in micronaire average between laydowns should be less than 0.2.
- Set the "run-time" or bale openers/pluckers to be as high as possible. The use of multi-cell mixers/blenders is desirable.
- Develop a set procedure for "cross-blending" between processes.

Barre and the Influence of Yarn Count Variation

What is count variation?

Inconsistent weight per unit length within a yarn or between yarns of the same count.

Yarn count variation can occur as a result of inconsistencies within the fiber processing and yarn formation systems. For example, weight variation within finisher draw sliver will create yarn count variation. Furthermore, the fabric produced will likely have bands or streaks in the course wise direction in knit fabrics and in the warp and filling direction of a woven fabric. The following evaluation was designed to determine the level of yarn count variation between yarns which could induce barre.

Nine open-end yarns were spun from one bale of Acala cotton (Table 4). The control yarn is a Ne 30/1 KP 3.9 T.M. The OE frame remained at a constant draft (198.3) and twist. The finisher sliver weight was then adjusted to simulate an actual mill situation. The following yarns were then produced on the OE spinning frame by adjusting the finisher sliver weight from the draw frame.

< Table 4 >

Control Set-UP

28 - 28.5 - 29 - 29.5 -- 30/1 Ne -- 30.5 - 31 - 31.5 - 32

3.90TM

The resultant yarns were knitted into a 28 cut single jersey fabric on predetermined feeds (Table 5). The control fabric (A) was mode from Ne 30/1 count yarn only.

Table V

Fabrics Produced
28 Cut 60 Feed Single Jersey

Fabric	Component 1		Component 2	
	Yarn Count (Ne)	Feeds	Yarn Count (Ne)	Feeds
A	30/1	60		
B	30/1	59	28/1	1
C	30/1	59	28.5/1	1
D	30/1	59	29/1	1
E	30/1	59	29.5/1	1
F	30/1	59	30.5/1	1
G	30/1	59	31/1	1
H	30/1	59	31.5/1	1
I	30/1	59	32/1	1
J	30/1	20	28/1	40
K	30/1	20	28.5/1	40
L	30/1	20	29/1	40
M	30/1	20	29.5/1	40
N	30/1	20	30.5/1	40
O	30/1	20	31/1	40
P	30/1	20	31.5/1	40
Q	30/1	20	32/1	40
R	Random 28/1, 28.5/1, 29/1, 29.5/1, 30/1, 30.5/1, 31/1, 31.5/1, 32/1			

The fabrics were bleached and evaluated to determine evidence of barre. With respect to fabrics B through I, only B and I had evidence of barre. With respect to J through Q, all of these fabrics had differing degrees of barre. The random sample appeared streaky and had an uneven surface appearance.

In conclusion, just one half of a count difference showed evidence of barre when fed as a band on 20 feeds and 40 feeds. The random sample, which only represents a 6.67% deviation from the desired yarn count, was of noticeably lower quality than that of the control yarn fabric. It is also to be understood that as the yarn count is changed on a fixed OE spinning frame, the calculated twist multiple varies as well. The basic results of this evaluation would also apply to ring and air-jet spinning systems. This evaluation shows the importance of tightly controlling the yarn manufacturing process when desiring to provide a world class, top quality product.

Key Points for the avoidance of yarn count variation barre are:

- Maintain consistency throughout the yarn formation process
- Control fiber properties and ensure homogeneous blending
- Control and maintain card and draw sliver weights
- Utilize cross-blending techniques between carding and drawing processes for increased leveling
- Educate machinery operators and fixers about how they can affect yarn quality
- Employ rigid quality control schedules and procedures for each processing step

Barre and the Influence of Twist Variation

What is Twist Variation?

Inconsistent twist level within a yarn or between yarns of the same yarn count.

Twist variation most often occurs due to poorly maintained ring spinning equipment. Running spinning frames with spindle tapes from different manufacturers, tapes which are worn or tapes which are improperly positioned can all be sources of spindle speed variation within a machine or from machine to machine. The resultant variation had

been known to create problems in the finished fabric. As yarn twist varies, so will the way in which that yarn reflects light. This evaluation was designed to determine the level of twist variation which could induce barre.

Four combed yarn conditions were spun from a bale of Delta cotton.(Table 6)

Table VI	
Ring Yarns Produced Ne 28/1 CP	
3.8 T.M.	20 TPI
3.6 T.M.	19 TPI
3.4 T.M.	18 TPI
3.2 T.M.	17 TPI

All other parameters held constant, the machine twist per inch was adjusted to simulate a typical twist variation situation.

Then, yarn was knitted into a 28 cut single jersey fabric on predetermined feeds with different twist levels.(Table 7)

Table VII		
Fabrics Produced 28 Cut Single Jersey		
Fabric A	3.8 T.M (20 feeds)	3.6 T.M. (40 feeds)
Fabric B	3.8 T.M. (20 feeds)	3.4 T.M. (40 feeds)
Fabric C	3.8 T.M. (20 feeds)	3.2 T.M. (40 feeds)

The resultant fabrics were pad batch dyed and ten evaluated for barre. (Table 8)

Table VIII		
Fabric Barré Evaluation		
Twist Variation	Fabric	Comments
5%	A	Slightly visible shade difference
10%	B	Visible shade difference
15%	C	Bold shade difference

The results shown in Table 8 display that only a 5% variation of twist can cause visible barre. Twist variation should not be overlooked when considering important yarn quality factors. Twist variation occurs in ring spinning as mentioned previously. In addition, twist variation can occur inadvertently from improper gear selection on all spinning systems.

Key points for avoidance of yarn twist variation barre are:

• keep twist variation under5%

• Maintain and monitor spinning machinery in a consistent manner.

• Avoid mixing yarn lots on knitting or weaving machinery.