The Solutions for Controlling Fabric Barré

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ABSTRACT

Spinning mills have many options in the raw material they purchase for producing yarns. This expansion in the availability of raw material has helped to reduce cost and to improve yarn quality and spinning efficiency. Traditionally, purchased cottons had well established seed varieties and growth regions. This resulted in few dying and finishing problems by controlling the average micronaire. Over the past few years, there has been a rapid increase in the problems with dying and finishing, especially for 100% cotton knitted fabrics. Fabric barré and white speck neps are two of the problems that spinning mills that use cottons from different growth areas face. Mixing cottons by the average micronaire does not give the necessary control for eliminating these costly defects. Mills experiences and trials have provided the necessary information to set up guidelines for controlling fiber properties that influence the dyability of cotton yarns in knitted fabrics. There are several mechanical causes that can also influence the dying of fabrics. This paper offers several solutions for controlling the key fiber properties that cause barré in fabrics.

Introduction

The current expansion of the world-wide market for cotton has opened up many possibilities for the spinning mill. Spinning mills now have many options in the raw materials they purchase for producing yarn. This expansion in the availability of raw material has helped in reducing costs and improving yarn quality and spinning efficiency. Unfortunately this situation has also presented some new challenges for the spinning managers and cotton buyers. Traditionally cottons had well established seed varieties and growing regions. This meant that with an average control of micronaire they had few problems with the dying and finishing of cotton fabrics.

Over the past two years there has been a rapid increase in problems with dying and fabric finishing. This is especially evident in the claims and rejects of 100% cotton knitted fabrics for barré. Claims and rejects can easily wipe out any savings in raw material costs obtained by purchasing cotton from several international sources. Figure 1 is a classic example of the problems related to mixing cottons of similar micronaire but from different growing regions and seed varieties. Many spinning mills are under the impression that all upland seed varieties mature the same as related to the micronaire. Unfortunately cottons with similar micronaire but from different growing regions and varieties dye differently.

Controlling some of the basic fiber properties can give the spinning mill the information necessary to reduce and or eliminate the recurring problems of barré. Mill experience and trials have given us the necessary information to set up guidelines for controlling the fiber properties that influence the dyability of cotton yarns in knitted fabrics. There are several mechanical causes of fabric barré that are associated with the spinning and sliver preparation processes in the spinning mill but fiber properties are the major causes of barré.

Fabric Barré	
Cause	Percent Defects
Fiber	70%
Yarn Count Variation	10%
Twist Variation	10%
Hairiness	10%

While mechanical differences and variations in yarn count, twist and hairiness can also be a cause of the barré effect the single largest cause lies in the variation in fiber properties. The fiber properties that have a major influence as causes of barré are Micronaire, maturity/fineness and fluorescence that all play a major roll in the consistent dying and finishing of knitted fabric.

Micronaire

Most mills have learned over the years that they need to control the average of the micronaire in the bale laydown. Most mills have some system to categorize cotton bales into groups in an effort to control the average micronaire. This system is then used when selecting the bales from the warehouse. While controlling the average micronaire is a good first step many times this is not enough control to eliminate the barré effect, especially in knitted fabric. The causes and controls necessary for eliminating dying problems as they relate to micronaire are:

- > 0.2 difference in Micronaire value
- > Change in average Micronaire from mix to mix
- > 10% Micronaire CV within a mix
- Bales with the same Micronaire placed side by side

. The additional control of the variation or CV% of the micronaire must be added to the overall control of the average in each laydown.

It is also necessary to change the average of the laydown over time so that all bales in the warehouse can be processed. The change in average micronaire in the laydown must be changed slowly over time as shown in Figure 2. The maximum bale to bale variation within the mix should be 10%. A variation of micronaire higher than 10% will very likely cause a barré effect in the fabric. Figure 3 is an example of a 24 bale laydown that does not meet the 10% variation guidelines.

Maturity and Fineness

Micronaire is an indication of the maturity in cotton fiber, although it is not a direct measurement of the fiber maturity. Micronaire can be used successfully to control barré if the cotton being processed is from the same seed variety. If cottons from several varieties or growing areas are being blended together, then additional testing and maturity information may be necessary. The causes of barré that are typically the result of changes in cotton maturity are:

1) Blending cottons from different growth areas
2) Blending cottons from different varieties
3) Seasonal changes in cotton growth cycle
    a) Weather
    b) Insects
4) Immature fiber content (IFC%)
    a) White speck neps
    b) Carding speeds.

An example of fabrics made of yarn produced from three (3) different bales of cotton is shown in Figure 4. The cottons all had the same micronaire (4.2) but, as can be seen, the dye uptake on the individual yarns was very different. Figure 4 is a good example of how cotton fiber maturity (not micronaire) can cause a barré effect in fabric. These bales of cotton were tested on the HVI instrument and the yarn was tested on the Uster Evenness tester. These results are shown in Figures 5 and 6. It is not possible to determine any significant differences between these three cottons that would cause a problem in dying and finishing. The cottons are also tested on the new AFIS Length and Maturity to determine is any differences could be found. The results from the AFIS Maturity module are shown in Figure 7. The AFIS Maturity module is a single fiber measurement of individual fiber maturity. The individual fiber maturity information gives a distribution of fiber maturity as well as the average fiber maturity. The distribution enables us to identify the very immature fibers and it is described by the Immature Fiber Content (IFC%). Figure 7 shows a considerable difference of the three bales in the IFC%.

Maturity differences in cotton can also cause defects in fabric such as white speck neps. Fabrics in Figure 8 were knitted from yarn produced from three different cottons having similar micronaire values. There was a significant difference in the amount of white specks in the three fabric samples. The three cottons were tested on the AFIS Maturity module and the results are given in Figure 9. The differences in the AFIS IFC% correlates visually to the amount of white specks in the three fabrics. Interesting is that the overall average maturity ratio for the three cottons was very similar, giving no indication of a potential problem of white speck neps.

Variation of Maturity in Sliver

There is a possibility to optimize the carding process to make sure all cards remove as much of the immature fiber as possible. Figure 10 shows the results of testing a line of cards all fed from the same bale laydown. It is interesting that while the card mats show similar results the card slivers show considerable variation. The possibility of the influence of carding on the maturity of the sliver was investigated using the AFIS Maturity module. Several individual cards were analyzed and it was apparent that there was a large variation in the amount of immature fibers removed by the cards. This trial indicates that it is possible to change the mechanical set-up of a card to influence the removal of immature cotton fibers. These results are shown in Figure 11.

Fluorescence

Another major cause of fabric barré is a change in the cotton fiber fluorescence. Fluorescence can be measured by the Uster Fiberglow, which measures the ultraviolet light that is reflected from the cotton sample. Fluorescence (UV) is not cotton colour, but the effect of sunlight on the structure of the fibers. The specific causes of barré as it relates to fluorescence are:

- Variation in average UV readings between mixes
- CV% in UV reading within a mix
- End of season cotton crop changes
- Outside storage of cotton bales
- Mixing high and low UV bales
- UV readings increase over time in the warehouse

Bale laydowns should be controlled using similar techniques to those used for micronaire. The solutions for controlling fluorescence are:

- UV test every bale before making a mix
- Maximum 10 point difference in UV readings within a mix
- Maximum change in UV average 1 point between mixes
- Set up category groups for UV

Examples of controlling the UV reading within the bale mix and between the mixes is shown in Figures 12 and 13. Variation within a single mix should no more than +/- 5 points. The average UV reading of the mix should not change more than +/- 1 point from mix to mix.

There is a normal change in the UV readings from year to year, due to seasonal changes and difference in UV from cotton stored in a warehouse for 9 - 12 months. Blending old and new crops must be done carefully to reduce the chance of creating fabric barré. Typically each year, the new crop has a different UV average and range, depending on the weather at the time of harvest.

Conclusions

At least 70% of the causes of fabric barré are due to variations in fiber properties. There are specific solutions available for spinning mills to control the key fiber properties that affect the dying and finishing of cotton fabrics. Individual bale measurements of micronaire, maturity and fluorescence will help the spinning mill to control all aspects of fiber barré problems. The exact solution will depend greatly on the specifics of end product, spinning system and raw materials used by individual mills. Application guidelines are available for use in selecting bales for mixes and storing bales in the warehouse. Instruments and software programs are available to help the spinning mill monitor and control these specific fiber properties.

Figure 1: Fabric barré.

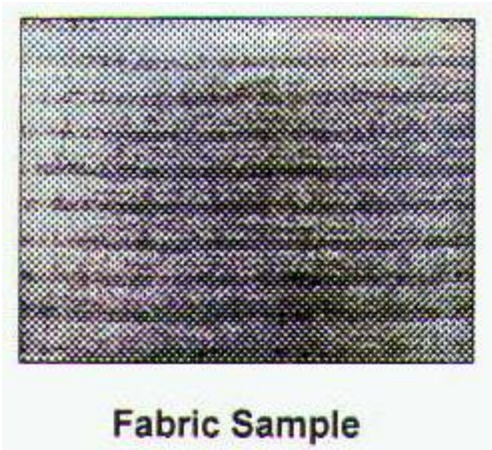

Figure 2: Acceptable changes in Micronaire from mix to mix.

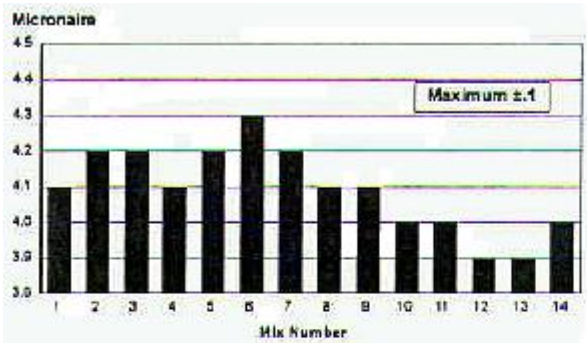

Figure 3: High micronaire CV% in mix.

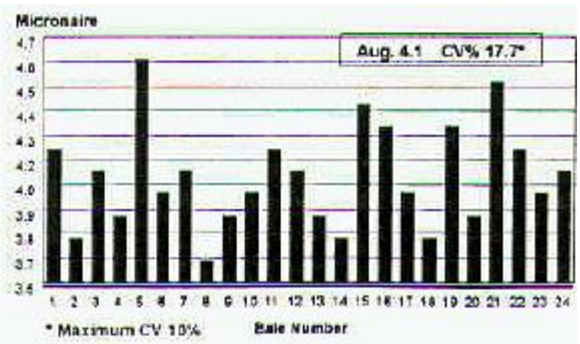

Figure 4: Knitted fabric samples: Three varieties, same mix, same growing area.

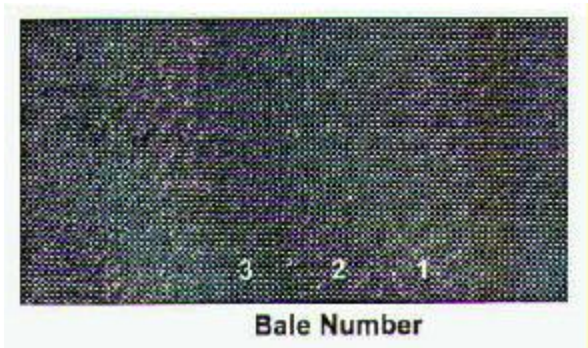

Figure 5. HVI bale data: Lint and micronaire analysis.

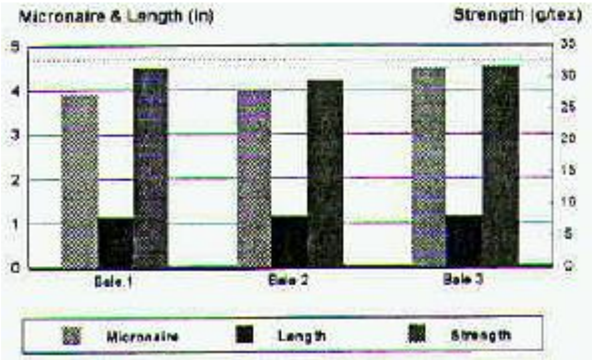

Figure 6. Uster yarn data (Ne 26).

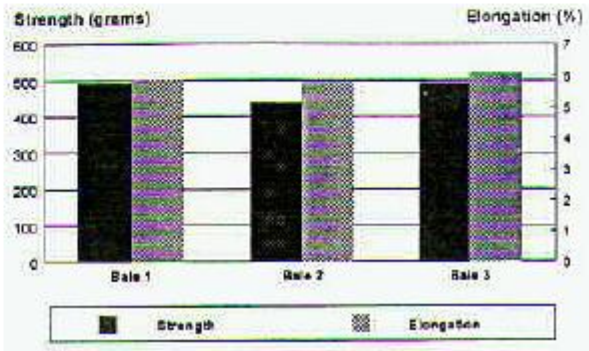

Figure 7. AFIS maturity modules: Maturity analysis.

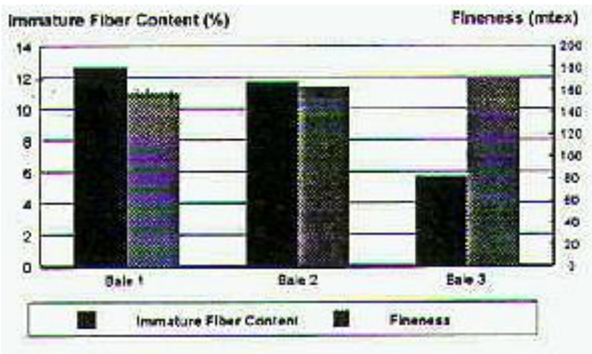

Figure 8. White speck neps.

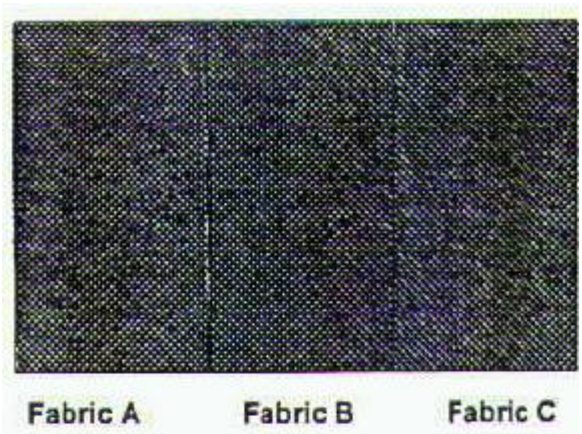

Figure 9. Fabric white speck defects: AFIS maturity module.

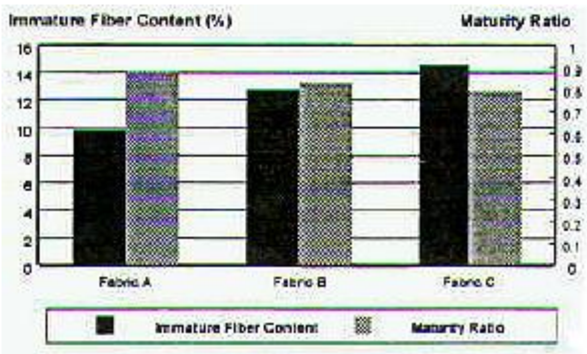

Figure 10. Card mat and sliver variations: AFIS maturity analysis.

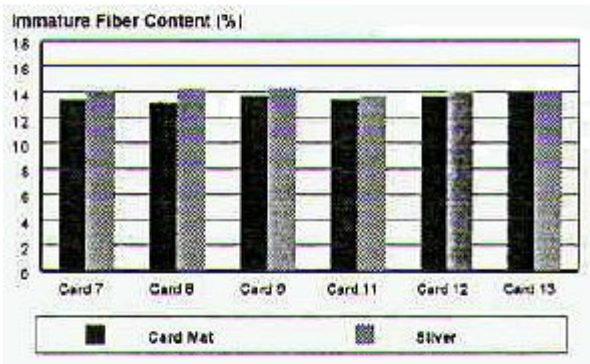

Figure 11. Variation in card sliver: AFIS maturity module.

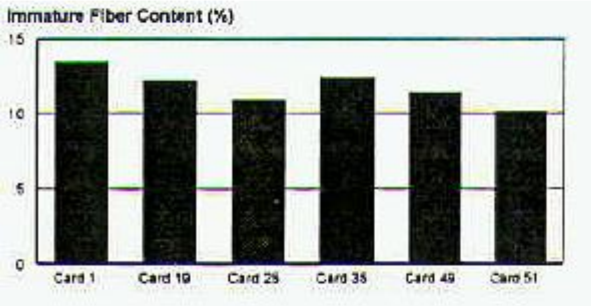

Figure 12. Variation in bale UV within mix.

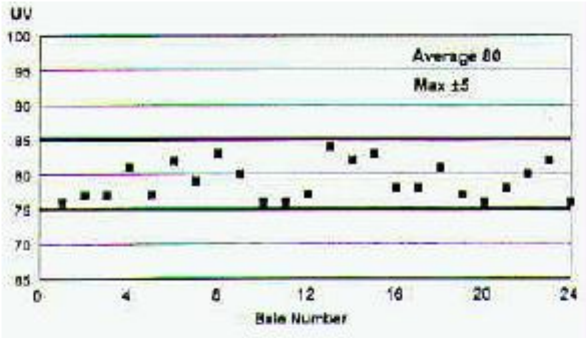

Figure 13. Variation in mix average UV: Causes of barré.